

Thirty Leading Articles *on* Physiotherapy



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Introductory

During the past few years the Educational Department of this Company has published a vast number of reprints of lectures case reports and articles dealing with the various branches of physiotherapy. In this volume we have assembled the more important of these reprints, chosen to cover a comprehensive range of subjects and representing the work of many of the more prominent physicians and surgeons whose development of the uses of physiotherapy has attracted widespread attention. In most cases we have used the actual type pages of the original reprints which accounts for the minor typographical differences that will be noted throughout the book.

We wish to acknowledge on behalf of both the compilers and the readers of this book a debt of gratitude to the various authors represented herein. The medical profession and particularly that large and growing section of it which is interested in physiotherapy owes much to their vision and their painstaking work.

Diathermy In Internal Medicine

In an article entitled, Diathermy in Internal Medicine published in The Journal of the American Medical Association July 26 1924 p 266 Edward W Jackson M D Rochester N Y says that many persons complain of heart pains He believes that a large percentage of these pains are diagnosed erroneously as angina pectoris His examination frequently discloses the cause of the pains to be a neuralgia or myalgia of the chest wall The slow and often unsatisfactory results obtained in treating these conditions with rest medicines, conductive and convective heat and other time honored remedies led Jackson to investigate diathermy the only method he knows of whereby it is possible to apply physiologic heat to tissues beneath the surface Jackson emphasizes the fact that a proper technic is as important in diathermy as in any other therapeutic measure. In fact, a better judgment and a broader general knowledge of medicine are required in the proper application of diathermy and in the selection of cases for treatment than in most other therapeutic measures

In all 1470 treatments were given by Jackson to sixty-one patients, divided among the various body systems as follows circulatory 526 nervous 266 respiratory 54 joints 352 muscular 223 and urogenital 39 Full use of the various diagnostic measures was made in the study of these patients When found foci of infection were removed but diathermy was not withheld pending a clearing up of the foci of infection This Jackson says is important since during the treatment prompt relief was obtained in many painful conditions thereby proving diathermy of diagnostic value and lastly when successful of economic value in curtailing further diagnostic and therapeutic expense Thirteen selected hypertensive patients who had been under Jackson's care for three or more years agreed to co-operate for the purpose of investigation for more than one year The treatment for a year or more had been a simple general diet rest, including a midday rest period and care in avoiding emotional disturbances good elimination and hygiene During this period of what Jackson terms rational treatment the patients had been seen every month or two and the blood pressures had averaged remarkably uniform for each case

The types into which these cases fall are (1) climacteric five (2) essential hypertension three (3) nephritic three,

and (4) arteriosclerotic, two cases. To avoid unfavorable emotional and physical disturbances, these patients were treated in a quiet darkened room tight clothing was loosened and they reclined comfortably on the dielectric pad. The office type Tycos instrument was used the sleeve being left in situ during the treatment. Before starting the treatment blood pressures were taken at intervals of from one to three minutes until no further lowering was recorded. This usually required from five to ten minutes. The treatment was then given. Until the final pressure reading was made, every precaution was taken so that the patient was not disturbed. The D Arsonval circuit was used.

The length of treatments varied from one half to one hour mostly the latter the frequency of treatments varied from one to five weekly. Jackson found that too prolonged treatments with high milliamperage were weakening. Under ideal conditions of the application of diathermy to reduce hypertension the patient should rest in bed for several hours directly after treatment. The retention of the heat in the body tissues would thus be aided and its physiologic action prolonged and augmented. Jackson's investigation had now been carried on for more than a year. It had been determined that, with careful attention to details diathermy would reduce arterial hypertension and as long as the treatments were continued would keep the pressures within safer limits.

Properly applied the treatments were time consuming and harassing. Therefore Jackson entered into an agreement with eight of these patients whose home conveniences were such that sedative baths could be taken at their pleasure to compare the action of baths with his records of diathermy in reducing their pressures. The physiologic effects of such a bath under the prescribed conditions followed by nocturnal bed rest for from eight to twelve hours were superior to other methods of hydrotherapy in the treatment of hypertension.

Invariably the reduction of pressures following these baths compared favorably with diathermy. Restlessness insomnia and weakness followed over treatment as with diathermy and it was necessary to adjust the frequency and duration of the baths and to caution that the proper temperature of the water be observed. In time these baths prove irksome and are likely to be indifferently performed by the average patient. Even with this selected group frequent observation and evidence of the physician's deep interest were necessary to encourage them. There is a minimum to which any given case of compensatory hypertension may be reduced without provoking symptoms and signs of circulatory failure. As long as the fall of the pres-

sures is unaccompanied by circulatory or nervous discomfort whatever the method used it is safe to proceed cautiously with attempts to lower them

Baths and diathermy singly or when wisely combined and adjusted to fit the particular patient are equally efficient in reducing hypertension. This reduction persists as long as the treatments are continued provided the other important factors—rest diet and hygiene—are faithfully observed. When baths and diathermy are stopped or indifferently performed the pressures gradually creep up. A proper application of diathermy is but half the treatment the other half is the after care. Five patients with organic angina, all men in late middle life with a chief complaint of substernal pain, believe that diathermy has been of definite value to them their attacks being less frequent and severe. Jackson is convinced that the symptomatic relief obtained has justified its use. If complete relief is not obtained from diathermy a source of infection must be located elsewhere in the body and removed. The results obtained from 1,470 applications of diathermy to sixty-one patients suffering from various conditions common in internal medicine have convinced Jackson that diathermy is of value for the reduction of arterial hypertension but sedative baths under carefully prescribed conditions are equally helpful. Diathermy has given symptomatic relief in many painful conditions more promptly than was obtained under usual treatment and it is an addition to other therapeutic resources. Jackson recommends that diathermy be studied in hospitals and large clinics to define its scope indications and limitations.

(Reprinted from *Fischer's Magazine*)

Physiotherapy Now Taught In Many Colleges

A recent survey of the field discloses the fact that a large number of well known Universities now include instruction in Physiotherapy in certain of their courses. The following list will show how extensive is this recent development.

University of Pennsylvania, Philadelphia "The curriculum of the students in the undergraduate department includes an excellent lecture course in Physiotherapy conducted by Dr. R. Tait McKenzie, professor of Physiotherapy in the school, and director of physical education in the University."

Dalhousie University, Halifax, N. S. "Apart from the didactic instruction which is given in the course in therapeutics the teaching in Physiotherapy is almost entirely clinical, and determined by the nature of the cases under treatment."

Tulane University of Louisiana "Physiotherapy is taught to the regular medical students. No courses of any kind are offered to medical graduates or to nurses in the School of Medicine."

University of Wisconsin Madison "We are giving a course this year in Physiotherapy to our third year Medical students, which is a part of the regular curriculum in Therapeutics. We will no doubt have post graduate courses for physicians later on—perhaps intensive courses of instruction for periods of two weeks. We are also giving during the second semester a course in Physiotherapy, as a part of the nurses training course."

McGill University, Montreal "We give a short course on Physiotherapy in connection with the Department of Therapeutics. However next year we are hoping to inaugurate a much fuller course."

The University of Vermont Burlington "Physiotherapy is taught in the Dispensary two days a week and while we are glad indeed to have physicians attend these exercises it probably does not offer a satisfactory course."

University of Alberta Edmonton Undergraduate medical students are given instruction in Physiotherapy at the University of Alberta Hospital.

University of Manitoba Winnipeg This year we have

instituted a course in Physiotherapy for our third year students. This course consists of lectures and demonstrations'

Vanderbilt University, Nashville 'We have a small Physiotherapy plant in our new hospital, and hope that we may take nurses and possibly doctors for training later'

The Long Island College Hospital Brooklyn 'We have recently organized a course in Orthopedic Nursing for registered nurses and in this course Physiotherapy is one phase of the general subject.'

University of Minnesota Minneapolis 'Last year the University of Minnesota, Medical School through the Extension Division gave a course in Physiotherapy for physicians with Dr Granger of Boston in charge. This course was a great success.'

University of Michigan Ann Arbor 'We are giving a special course in Radiotherapy and inasmuch as our department has connected with it Heliotherapy a course could possibly be arranged to include Physiotherapy generally.'

University of Toronto, Toronto The subject is touched upon in various courses such as in the Department of Therapeutics, but there is no specialized department in which Physiotherapy is taught apart.

University of Buffalo Buffalo 'We have no courses in Physiotherapy that a physician or registered nurse may attend but we do give a course in Physiotherapy to our medical students. This course is required.'

Detroit College of Medicine and Surgery The Detroit College of Medicine and Surgery offers instruction in the general principles of Physiotherapy to regular registered members of the Junior Class in that institution.

Columbia University New York In presenting a post graduate course in Physiotherapy to the medical profession it is the desire of Columbia University to include such work and lectures as to qualify the members of the course to actually practice and administer the different forms of Physiotherapy. This course is arranged for licensed practitioners of medicine only and it is felt that in a period of six weeks of daily clinical work together with eight or more lectures the members will be able to acquire a general working knowledge sufficient to practice Physiotherapy.

The course will be given at The Beekman Street Hospital which is located in the downtown business and shipping district of New York City on the corner of Beekman and Water Streets. It has very active Acute Medical Surgical and In

dustrial Accident Services, well patronized Out Patient Department and the work in the Department of Physiotherapy is mostly in the treatment of traumatic conditions from the acute through the convalescent stages and up until the patients can return to work."

Stanford University Medical School San Francisco "A 6 months course is available at the Stanford University Hospital to a recent graduate in medicine who has completed at least one year's hospital work in medicine and surgery

Walter Reed General Hospital Washington 'The department of Physiotherapy at Walter Reed Hospital is devoted to the treatment of both medical and surgical cases. It is fully equipped. The treatments are administered by a staff of Physiotherapy Aides under the supervision of a Medical Officer the Director of Physiotherapy'

College of Medicine of Syracuse University Syracuse, N.Y. 'Six lectures and demonstrations are given to the fourth year students in physiotherapy'

It will be noted that the scope of the work varies all the way from a few lectures and demonstrations to a complete course which may be taken by the graduate M.D. What this means for the future development of this comparatively new branch of Medical Science may readily be appreciated. The labor of pioneers in recent years is bearing fruit in a manner that must be most gratifying to that band of earnest workers whose efforts have brought Physiotherapy to the fore.

(Reprinted from *Fischer's Magazine*)

Physiotherapy as Used by the General Surgeon

By E. C. HENRY M. D

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The modern surgeon requires many things besides the knife. The deeper he studies the human body, the profounder becomes his respect for it.

It is such a simple matter to amputate an arm or leg but skill and cunning it takes to save an infected limb. In its final analysis infection in some form is the life problem of the surgeon. At least eighty per cent of his time and thought is given to some form of infection. So the surgeon's work falls into three great divisions.

First—How does the body react to infection?

Second—How can he help?

Third—What outside agencies can he call to his aid?

Probably the cleanest and best monograph ever written on 'Inflammation' was a little book by Adamo Bloodgood told me at one time that he had read and reread this book ten times. Possibly some of the rest of us could read it to advantage three times. Adamo will convince you that the body reacts as a whole when invaded by bacteria. No matter where the port of entry the remotest cell in the body knows about it and responds. True a local battle may be fought but in every case either the bacteria or their toxins invade the whole organism. Of course this is harking back to the days of John Hunter, that Master Surgeon who taught one hundred years ahead of his time.

The body does such a variety of things when infected all of which must be taken into account. It does not always do the same thing but a keen observer will gain much information from some of these symptoms—pulse temperature respiration muscle spasm change in blood count and last but not least the attitude of the patient by which we mean facies position movements etc. Remember that the mind both conscious and unconscious is affected.

As a good illustration of these three divisions facing a surgeon let us consider acute appendicitis. In spite of all that has been written and discussed about appendicitis it is



Position of electrodes in diathermy treatment of pneumonia

the most common and fatal disease of the abdominal cavity. For ten years our leaders have been shouting from the house tops, "Beware of sudden abdominal pain. Do not give cathartics." Yet in spite of this warning cases are brought to the hospital which have been miscalled indigestion and calomel or castor oil repeatedly given. England's best surgeon said he never saw a case of general peritonitis except in cases that had been given cathartics. If this is true, a physician must be severely condemned for giving a cathartic until he is sure the appendix is not involved.

The order of onset of symptoms is of prime importance. First pain usually over the whole abdomen—shooting pain so that the patient thinks something he ate is at fault. Second nausea or nausea and vomiting. Third rise in pulse rate. Fourth muscle spasm. While at first the pain is over the entire abdomen in a few hours it localizes in the region of the appendix and as this is usually in the right side Mc Burney's Point is tender and rigid. But not always. The appendix may be down in the pelvis or on the left side and in the former case there may be no rigidity. Soon the temperature will come up and a blood count nearly always shows eighty per cent polynuclears.

Patients with this acute abdomen do not thrash and roll around turn over on their stomach or get up and walk the floor. Perfect quiet and nothing touching the abdomen is their desire. Often the face has a peculiar drawn anxious expression and this is invariable when general peritonitis is advanced.

Such is the picture of a representative type of infect-

and the body response. It is an ideal case to show what the skilled surgeon, who knows his pathology and aids, can do. His duties are threefold. First, provide drainage. In many cases this will include removing the appendix. Providing proper drainage is the greatest single service the surgeon does in all septic cases. (As this is not a paper on surgical technique we will not dilate on that point.)

Second his duty is to conserve the vital forces of the patient. Vitality is quickly lowered by pain, therefore opium is now our best friend. Next to pain lowering vitality comes loss of fluid. By the flush method the large bowel can be supplied with all the fluid required by the system. Now follow the days and weeks fighting infection. And here is where Physiotherapy comes in.

Radiant Light and Actinic Rays will reduce the healing time one half. Superficial infections such as boils, carbuncles, erysipelas, we now treat exclusively by a combination of X-ray, Radiant Energy and Actinic Rays. Herpes Zoster can be cured by a single stimulating dose of Actinic Ray—air cooled.

Medical Diathermy and Surgical Diathermy are two modalities exceedingly important and useful in Modern Medicine. For example post-operative pneumonia yields like magic to Medical Diathermy. Large block tin or mesh electrodes are used on the chest and back so positioned as to include the affected area between them. Diathermic heat is then developed with in the tissues themselves—a vastly different more beneficial process than the mere application of surface heat.

As a typical example of the value of surgical diathermy there are two locations where cancer is very common and Surgical Diathermy is exceedingly useful. One is cancer of the tongue. Here the cancer originates in the mucous membrane which rests directly on the muscle tissue.



Surgical therapy etc etc

composing the body of the tongue. The tongue is abundantly supplied with lymphatics. These two anatomical facts explain why cancer here is so quickly fatal and why it so soon forms metastases.

One other clinical fact should be borne in mind. Syphilis of the tongue often occurs with cancer, so that a positive Wassermann must not mislead us and cause us to lose valuable time with antisyphilitic treatment when our efforts should be directed toward the cancer.

The most thoughtful surgeons agree that the knife is a failure in cancer of the tongue. Surgical Diathermy accomplishes all that the knife does, and more. No blood is lost. No lymphatic channels are opened. No time is lost for taking food, which may be important in run-down patients. Twilight sleep is used and care taken to avoid sparking. This last point is of major importance in dealing with cancer in any part of the body by Surgical Diathermy.

Cancer of the cervix of the uterus is probably the best example of the hopelessness of surgery in dealing with cancer. Wertheim devised the most extensive abdominal operation known to surgery in trying to improve the record for cures. His results showed a primary mortality of twenty five per cent. But more discouraging still, his records show a recurrence in *all cases* where lymphatic glands had been invaded.

If we can accept his own figures, then we must admit his special operation a failure. No surgeon can survive a primary mortality of twenty five per cent especially when it is shown that such an operation is useless if the disease has become so extensive as to call for it—that it has invaded the adjacent lymphatic glands. If the cancer has gone deeply into the surrounding tissues neither Radium Deep X ray or Surgical Diathermy will check the disease. But *early cases* still local, are better handled by Surgical Diathermy than the knife. As in tongue cancer so here no blood is lost. No fresh channels are opened up and there is no shock.

The technique of handling both Medical and Surgical Diathermy is comparatively simple and can be easily acquired. No well trained surgeon is carried away with the belief that these new modalities are going to do away with the great fundamental principles of Surgery. But they are excellent adjuvants indeed to the rest of his armamentarium.

Diathermy in Lobar Pneumonia

By HARRY EATON STEWART M. D
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(From *Amer Jour Elec & Radiol*)

We are entering the fourth year of our clinical study of the effect of diathermy in lobar pneumonia. The beginning and a large share of the total amount of this work was done here in New York at the United States Marine Hospital on Staten Island.

Being frankly experimental the beginning of the work was postponed until we had a case in which there was apparently no other possible chance for recovery. Such a case soon occurred in a patient whom we saw on the eleventh day of an extending lobar involvement with every sign of impending death. The result obtained in this preliminary test case was one of the most dramatic in the author's medical experience. The patient's cyanosis, which was extreme disappeared almost immediately after the maximum heat was reached his expiratory grunt ceased and he returned to consciousness, expressing a feeling of relief which lasted about four hours during which he slept soundly. There was some improvement in his thready irregular pulse which gain became marked and permanent following the next few treatments. His temperature fell by lysis and he made an uninterrupted recovery.

Realizing that this result might have been accidental we were encouraged to continue with a series of ten cases. In all of these and the subsequent cases treated clinical and laboratory findings were made entirely by the regular hospital staff and the writer's department was concerned merely with the administration of the treatments. Except for one case practically moribund on admission with four lobes involved by a streptococcal infection septicemia and empyema these cases all recovered. A second series did equally well under diathermy after which it was decided to run a series of controls for a comparative study.

You do not have to be reminded of the caution that must be exercised in accepting any treatment as of value in this disease. Pneumonia varies widely in its mortality in different seasonal epidemics, in groups of cases in which different types of the organism predominate according to the patient's age, alcoholic history and the conditions under which the illness occurs. We thought we had a rather unusual opportunity in this hospital for the study of a treated and control group. The cases ad-

mitted were practically all merchant seamen who in the two groups averaged about thirty five years of age with practically the same alcoholic histories and similar living conditions aboard ship. They were treated exactly alike by the same physicians and nurses in the hospital wards, except as regards diathermy.

The general average mortality in lobar pneumonia is believed to be about 35 per cent at thirty five years of age. This mortality would be increased somewhat in men of the type of life with whom we had to deal and by the conditions under which most of them were taken ill on ship-board. We have one series of 41 treated cases with an average mortality of 17 per cent and 21 cases used as controls with a mortality of 42.9 per cent a reduction of about 60 per cent in favor of the treated group.

Interest aroused in our work has led to the use of diathermy in pneumonia in a rapidly growing number of cases in hospital and private practice. This work has been done under the close observation of between fifty and sixty different clinicians whose unbiased opinion has been helpful in estimating the value of the treatment. The relief of symptoms described in the treatment of our first case has been practically the rule in the entire group reported on. The fall in temperature began immediately by lysis in all but three or four of all treated cases.

There is in private practice an increasing tendency to use diathermy only in the more severe cases and in spite of this the mortality has not risen much above 13 per cent. More than half of the cases treated with diathermy in which death occurred were apparently hopeless at the time treatment was instituted. Many of them were complicated by four or five lobe involvement marked pathology in the heart or kidneys, and present or recent pregnancy. Only a single case has been lost (as far as the writer is aware) in which diathermy was given before the third day of the disease.

Recent Case Reports

Of special interest are three groups of cases recently reported. One occurred in the Iowa Institution for Feeble Minded Children Glenwood Iowa treated under the direction of Dr T. B Lacey. These children Mongolian Idiots and low grade morons, have notoriously small resistance to serious disease. Dr Lacey was able to obtain a mortality of 10 per cent last year by using diathermy in pneumonia where heretofore his mortality had been very greatly in excess of that figure. The second group occurred among the miners in

the employ of a leading zinc company in New Jersey where for years the mortality from pneumonia had been exceedingly high. Exact figures are not yet available but it can be stated that a very great reduction in the number of fatal cases, apparently due solely to the use of diathermy has been obtained in the plant hospital of this company. The third group comprises a study of 154 cases of lobar pneumonia treated by Dr Groesbeck F Walsh in the Employees Hospital of the Tennessee Coal Iron and Railroad Co, Fairfield Ala., a report of which was read by him before the Internal Medicinal Section of the Southern Medical Association held at New Orleans La November 24, 1924.

In his series the cases that were moribund those with severe complications and those occurring among infants and children were excluded from both groups. Of his cases 122 were negroes and 132 whites. There were 31 females and 123 males. In the treated group of 95 twelve were lost (a mortality of 12.4 per cent) and in the untreated group of 59 twelve were lost (a mortality of 20.3 per cent). As was the case in our own control group the patients were treated exactly alike as to medicinal and nursing care by the same physicians and nurses.

X rays were obtained in practically every case. Up to the time of this study 400 cases of lobar pneumonia treated by the staff of this hospital since November 1919 gave a mortality of about 25 per cent. Dr Walsh feels as does the writer that his group is still too small to state that the mortality was lessened by the use of diathermy but his figures add distinctly to the presumption that it was.

These cases have been treated since February 1924 and it is expected that this season will greatly increase the figures obtainable. The symptomatic relief following treatment in all of these cases is practically identical with that described by me and he too reports not a single untoward effect from the use of diathermy. The writer's treatment technique as described in this paper was followed out exactly.

How can the almost invariable symptomatic relief and possible reduction in mortality be explained? The symptomatic improvement is immediate lasting in its full effect not over four hours and must be explained by the simple physical presence of the intrapulmonic heat developed. On the other hand the reduction of the mortality if such there be must be due to a stimulative effect on the body's natural defense against the pneumococcus.

The analgesia which the heat produces in sensory nerve termini accounts for the cessation of the respiratory grunt and

slightly increased respiratory excursions. The cyanosis, in part due to deficient aeration of the blood, and in part probably an index of the overload on the right ventricle, is nearly always diminished or completely dispelled. This is probably due to temporary improvement in the pulmonic circulation around the consolidated area. It is not probable that the solidified area itself is greatly affected. Increased quantity and ease of expectoration usually follows the treatment. There is some lowering of systolic and diastolic blood pressure after nearly every diathermy application. At first we felt that hypotension was a contraindication to the use of diathermy, but have not found it so in the light of subsequent experience.

In none of our cases did the temperature reach normal any sooner than it would have done in untreated cases. The use of diathermy does not then shorten the duration of the disease. It has, however, seemed to definitely shorten the period of resolution.

There are cases in which resolution is rather rapid with accompanying signs of toxin absorption. Diathermy should at once be discontinued if such condition arises.

The rationale behind the use of diathermy is totally different from that of serum. Hence there is no contraindication to their combined use where serum is clearly indicated. The employment of diathermy, an external procedure is followed by no unfavorable reaction does not have to be postponed awaiting the result of laboratory reports, and is apparently efficacious in all types of lobar pneumonia. Therefore it presents several advantages over the use of serum.

Technique

Diathermy is the application of the bipolar high frequency current of D Arsonval which produces a central heat between the surface electrodes. It can be given wherever there is alternating current by means of any one of several types of portable apparatus supplied with a milliamperc meter and capable of delivering 2,000 milliamperes of current.

For electrodes we usually employ the flexible composition metal 22 gauge cut in convenient sizes with edges turned over and rolled flat. For use over a single lobe plates about 5 by 7 inches, applied to the chest and back, are convenient. In treating two adjacent lobes one lung or both bases we use larger electrodes which will include the involved area. When it is necessary to treat two non adjacent lobes plates of the size for a single lobe treatment are employed and two separate applications of the current are given. The anterior electrode may be of flexible chain material when there is any great

irregularity in the contour of the chest. The preparation of the electrodes consists in warming them thoroughly and covering them with hot soap lather before applying them to the skin. The posterior electrode, clipped to the cord, is placed on a folded bath towel the mattress depressed and the electrode slid under the patient to its proper position without disturbing him. An additional towel or small pillow may then be crowded under it to insure good contact. The chest electrode may be gently held in place by the tips of the operator's fingers or secured with adhesive strips. Sand or shot bags and circular constrictions are to be avoided if possible. When the patient is restless, irrational or coughing heavily good contact must be secured in any event.

With everything in readiness the current is turned on slowly and gradually employing about five minutes to reach maximum of 1,400 to 2,000 milliamperes. This maximum may be maintained for twenty to thirty minutes, and then turned slowly and completely off. When patients are restless the cords must be so placed that it will be impossible for them to be pulled loose. In very severe cases treatment may be repeated every four hours. In the usual case two to three treatments in twenty four hours are sufficient. With the onset of resolution the treatments can be rapidly cut down both in amount and frequency. In the treatment of children the size of the chest should determine the proper electrodes to choose and a current of not over fifty milliamperes per square inch of the electrode surface given.

The cumulative experience of the profession in the treatment of this disease has taught caution in placing faith in any one method of treatment. Innumerable methods have been tried and discarded in an attempt to lower the heavy mortality incident to lobar pneumonia.

Clinical investigation of the effect of diathermy in lobar pneumonia offers certain advantages. Among these are

- a It is available wherever electricity is installed
- b It requires no cumbersome or very expensive apparatus
- c The technique of its application while exacting is neither very difficult nor complicated
- d Not a single untoward effect has followed the giving of some 1,900 treatments reported to date. We may therefore feel assured that properly given it is absolutely safe
- e No other part of the entire treatment regime of the patient even including the use of serum need be postponed or contraindicated when diathermy is employed

f Unlike certain other medical and surgical procedures, it has not proved its value almost wholly in the hands of one individual or institution. The writer is glad to acknowledge that a number of his co-workers have obtained a lower mortality in the treatment of their cases than he has in his own. He feels certain that what they have done may be equalled or surpassed by the Profession at large.

(From *Am. Jour Elec & Radiol* Feb 1925)

Tuberculosis of the Cervical Lymph Glands

By W B CHAPMAN M. D., CHAPMAN CLINIC
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Few people, either of the laity or profession realize the great prevalence of tuberculosis in the human race today. Any physician who makes a careful study of the conditions that come under his observation will be amazed at the great and varied number of diseases wherein tuberculosis enters either as a causative agent or as a strong complicating factor. This has been especially marked in the recent epidemic of feverish colds which has spread through this district, extending as far south as the peninsula of Florida. Owing to the mildness of the climate there being few days when the temperature was below the freezing point people were able to mingle freely and as a result this winter has seen the worst epidemic of infectious colds that I have had to deal with since entering the practice of medicine.

Unfortunately, people residing in the rural districts have a great aversion to fresh air and it is their custom to house themselves in poorly ventilated rooms that are heated to an excessive degree using either gas stoves or the old time kung heaters. This lack of proper ventilation causes a lowering of the humidity of the air with a consequent drying out of the mucus membranes of the nose throat and upper respiratory passages, making these areas very susceptible to the implantation of pathogenic micro-organisms. As a result of such climatic and domestic conditions I have during the past three months treated several hundred cases of upper respiratory infection and it at least 15 to 20 per cent found complications which pointed strongly to the presence of tuberculous foci. Almost all of these cases began with a sore throat that subsided after two or three days. Within a week however the lymphatic glands of the cervical chain began to enlarge. In a number of these cases the enlargements were marked and the neck was swollen until it stood out beyond the angle of

The differential diagnosis of cervical tuberculosis is often quite difficult.

Owing to the disease being located on an exposed portion of the body, an unsightly scar is very undesirable, especially among women, and the removal of a bit of tissue for microscopical examination is to be avoided. Another point, if there is a question of malignancy, there is always the danger of cancer cell dissemination and metastases.

Fortunately, however, in the majority of cases, a careful anamnesis will make this point clear. A history of pharyngitis, followed within a few days by a swelling of the glands in the neck which persists in spite of the usual systemic treatment, together with other tuberculous symptoms, will make a diagnosis of cervical tuberculosis positive.

PILARYNGITIS AND TONSILLITIS

We have all had experience with swollen cervical lymphatic glands following tonsillitis. These appear during the inflammation and subside rapidly, as soon as the tonsillitis is under control. This is not the case, however, with tuberculous cervical lymph glands. These appear some days or weeks after the inflammation in the throat has subsided and continue as a rule, to the point of caseous degeneration regardless of all medical procedures.

HODGKIN'S DISEASE

The condition that presents the greatest chance for confusion is Hodgkin's disease, it often being impossible to discriminate between the two without resorting to the use of the microscope. In Hodgkin's disease however, the first symptoms, unless there is a mediastinal involvement, is the appearance of the enlarged glands. There may be a history of a preceding exanthema with all of the numerous clinical manifestations of such conditions, but frequently such evidence is entirely lacking. The usual statement is that the patient had not felt well for some days or weeks and that recently the swellings had appeared. Another confusing factor is that in a great majority of cases, the enlarged

glands first appear in the cervical region which is the usual site of beginning Hodgkin's.

One factor in the differential diagnosis that has been greatly stressed by medical writers is that the glands in Hodgkin's disease remain discrete while tubercular glands present what is sometimes termed a conglomerate or fused mass. In my experience this differential factor is of little value. It is quite true that tuberculous glands fuse more often than those of Hodgkin's. However, we frequently find a typical Hodgkin's, wherein the glands lie so close together that a differential diagnosis from tuberculosis cannot be made by this method. There is also a possibility that Hodgkin's disease may be due to a low-grade tuberculous infection and we all know that the two conditions are frequently associated. The work carried out at Johns Hodgkin's and the discovery of the typical cells being the strongest proof towards the establishment of Hodgkin's disease as a separate entity. Another factor which makes the removal of tissue for microscopical examination dangerous is the possibility that Hodgkin's is a semi malignant type of lymphosarcoma in which case, tissue excision would simply mean a dissemination of metastases and a rapid spreading of the disease. This could be somewhat counteracted by using the actual cautery but as the disease appears on an exposed portion of the body, the unsightly scar following such a procedure would certainly not be desirable. The surgeon therefore is obliged to rely on the history, inspection, palpation and his clinical experience for the proper diagnosis. The most fortunate factor, however is that the treatment of both conditions is approximately the same.

In tuberculous lymphadenitis a general supportive treatment by diet, rest, cod liver oil, arsenic etc., combined with such physical agents as diathermy, general body irradiations with the deep therapy and quartz lamps combined with the X Ray furnished the basis of treatment for both conditions. The X Ray has a specific effect upon the glands, both in tuberculosis and in Hodgkin's disease they often disappearing as if by magic. With Hodgkin's, however we may expect a recurrence while in tuberculous lymphadenitis the cure may be absolute. Even though there may be some retained infection inside of the glands the shrinking and resulting fibrosis will stamp this out in time. I present herewith a case wherein the differential diagnosis between cervical tuberculosis and Hodgkin's disease was made only by the history and physical findings.

CASE HISTORIES



Figure 2

Case 2 — E M —
Male, Age 54, Carpenter by trade. Entered clinic complaining of swelling in right side of neck. He had been informed by various physicians that he had Hodgkin's disease, while one physician had diagnosed the condition lymphosarcoma. The family history was unimportant. One or two distant relatives had died from consumption. There was no tuberculosis in his immediate household, so far as he knew. Patient had had the usual diseases of childhood but had enjoyed robust health most of his life.

Following an onset of

mild sore throat, cold as he called it, some five weeks previous, a small lump appeared on the right side of his neck and rapidly spread down into the anterior superior clavicular space. See (Fig 2) Outside of the swelling the patient experienced no discomfort. There was no pain and the mass presented little tenderness. He occasionally ran a temperature of from 100 to 101 degrees F mainly in the afternoon or evenings.

The mass was plainly of lymphatic origin and the glands formed a fused adherent mass that was not movable under the skin. The diagnosis of Hodgkin's disease or lymphosarcoma was ruled out through the history and physical findings leaving cervical tuberculosis as the only probable diagnosis. The patient received treatment in line with our usual method for treating tuberculosis of all types, see Chapman T B Scale. In this case however the patient was given heavy doses of X Ray in order to dissolve the lymphatic growth. (Fig 3) shows the case one month after the beginning of treatment. At this time the



Figure 3

Physical Agents

glands were barely palpable and have since disappeared almost entirely. The patient has had no recurrence elsewhere and is in perfect health at the present time.

Chapman T B Scale

TREATMENT	PER CENT
Diet	15
Rest	25
Medicines	10
Serum	5
Ventilation	10
Sunshine	5
Surgery	5
Natural Resistance	25
	100
{ X Ray Diathermy Actinotherapy etc	50
	150

Of the complicating factors which we find most commonly associated with tuberculosis of the cervical lymphatic glands I will mention tuberculosis cutis which I will further divide into two groups. First scrofuloderma where there is an extension from the underlying lymphatic glands with ulceration and necrosis of the overlying skin and secondly tuberculosis verrucosa cutis wherein the lesions are mainly on the skin with an associated or secondary involvement of the underlying lymphatic glands.

SCROFULODERMA

In scrofuloderma we have the following symptoms. There is a sluggish ulceration or involvement of the skin resulting by

extension from an underlying caseating and suppurating lymphatic gland. The cervical glands are noted at first to be swollen often attaining many times their normal size.

At first they feel hard but especially after the application of heat, which is usually applied by the patient the underlying skin becomes distended and shiny, and as the necrosis of the gland proceeds the skin becomes a dull reddish or violaceous hue.

In occasional instances after reaching this state they disappear by absorption. Usually however the caseation and suppurative changes finally involve the skin which may show one or more points of softening and destruction resulting in the formation of



Figure 4

sinuses which lead down to the underlying diseased glandular structures (See Fig. 4). With the skin thus involved we may expect more or less secondary infection and the formation of superficial ulcers. These ulcers have a characteristic appearance. They are irregular in shape and the edges of the skin is undermined. Neither do we note the hard ring like area of fibrosis which occurs in syphilomata and epitheliomata. The base of these ulcers are covered by a greyish necrotic material and a thin watery discharge exudes from the sinuses. This condition is slow to respond to medicinal measures and even when the ulcers appear to be healed superficially we may expect a recurrence.

Of the medicinal remedies that have been tried with varying degrees of success I will mention cod liver oil and iodid of iron and a number of reliable men have reported success following the application of mercurial ointment. The efficacy of this procedure may be ascribed to the germicidal action of the mercury in combating secondary infection and also to the fact that very

frequently we find an associated syphilis which of course clears up rapidly under the specific treatment. Almost all of these cases require more or less surgical attention but after the infection has involved the skin complete extirpation of the process is out of the question.

TUBERCULOSIS VERRUCOSA CUTIS

This condition was first brought into prominent notice by the classic paper of Riehl and Paltauf, whose studies were based upon fourteen cases observed in Kaposi's clinic. It was by them thought to occur in adults who had to do with animals and animal products but we know today that many cases are also contracted from other tuberculous individuals. This condition is caused primarily by the inoculation of the cutaneous tissues with tuberculous matter whether derived from man or other animal. While it usually begins in an insignificant manner it may become very extensive and cover several inches of surface. One, several, or more small patches arise generally near together and soon coalesce forming an irregularly shaped or serpiginous area. The degree of inflammatory reaction present varies considerably the area or areas being surrounded by a band like redness with some infiltration. The whole patch is as a rule somewhat elevated infiltrated and beset with wart like papillary hypertrophy or with dull or purplish red tubercles or nodules which are isolated or grouped. This form differs from what I have classified as acrofuloderma through the fact that the infection begins in the skin and is often limited to the upper epithelial layers the underlying induration being due to an invasion of lymphocytes and fibroblasts. If the underlying lymph glands become swollen it is usually due to an absorption of toxins rather than to an invasion of the infective micro-organism. If the condition becomes extensive however the glands will become actively infected and suppurate, but as I have already mentioned this condition is a secondary process. The lesions of the skin instead of being soft and necrotic with the constant watery secretion from the underlying sloughing glands presents for the most part a dry scaly appearance (See Fig 6). There will be a certain number of postules which begin sooner or later discharging a small amount of pus and then heal over with a dry yellow scab. These scabs are usually easily removed on account of the necrotic base.

It has been observed that the back of the hands is a favorite site for the initial infection and one observer attributed this to

tuberculous subjects wiping the mouth with the back of the hand It has been proved a number of times that secretions about the outer surface of the lips will produce fatal tuberculosis when



Figure 5

applications whereas in the deeper seated strumous conditions the treatment must of necessity be largely constitutional Fortunately both of these conditions are amenable to the treatment by physical agents

In tuberculosis verrucosa cutis the deep therapy and ultra violet lamps are of great benefit This was first discovered by Finsen and the work that he did with the carbon arc has long since been accepted by medical science Where the involvement is primarily in the cervical lymph glands we are obliged to use the X Ray to break down the indurated tissues In all of these cases the physician bases his treatment on the location and severity of the disease If the case is mainly swelling with a minimum of skin involvement the X Ray and diathermy are the physical agents of choice the deep therapy and quartz lamps being used principally for their tonic effect but where there is extensive involvement of the skin the lamps are preferred for their direct

injected into guinea pigs In all of these cases we find other evidences of a tuberculous diathesis that is scrofulous ulcers sup purating glands lesions in the lungs bone sinuses etc

Frequently, as in the case reported herewith and illustrated in (Fig 6) there is associated involvement of both the skin and cervical glands and in surface inflammations there is always the accompanying secondary infection The treatment of the two conditions does not differ materially except where the infection is limited mainly to the skin the medication consists largely of external

germicidal action. In almost all of these cases the use of an ointment containing mercury hastens recovery. It has been found hazardous to use ointments containing mercury, arsenic and several other mineral elements as well as a number of vegetable compounds when using X Ray, so the physician will have to use some discretion in his treatment.

It has been my experience however, that few of these cases are cured by the use of physical agents alone. This might be due to the nature of the secondary infection. The infective microorganisms being refractive to the various rays, and also because tuberculosis and syphilis are quite frequently associated. This has been observed by all physicians of wide experience and has been brought out very clearly since the introduction of the Wassermann test. One large teaching hospital with which I was associated carried out Wassermann and tuberculosis skin tests as a routine measure. Out of 600 patients selected at random 15 per cent had positive Wassermann reactions, while the tuberculosis skin tests were positive in from 20 to 80 per cent, according to the age of the patient. As I have mentioned in my previous writings it has been found by investigators whose integrity cannot be questioned that from 60 to 65 per cent of all school children give positive tuberculin reactions at the age of 14 years also that in all cases where the lungs have been examined after death either active or healed tuberculous lesions have been found. These figures show how extensively the two diseases are instilled into the human race and while one or both may lie dormant throughout the life of the individual if one makes sufficient headway to be manifested by macroscopic lesions the weakened condition of the patient allows the other when present to develop. It has been long known by bacteriologists that pathogenic microorganisms may exist in symbiosis with each other and where one thrives and multiplies, the other does likewise.

This is a slight digression from the subject in hand but is a factor worth taking into consideration. I will now describe two cases that are typical of the conditions mentioned.

CASE HISTORY

Case No. 3. 1 — Female age 40 years. History of tuberculosis in family. Husband had died of pulmonary tuberculosis. Patient gave a history of weak lungs. A few months previous to examination she had noticed two hard swellings on right side of neck (Fig. 4). After some weeks these became red on the

surface and tiny holes appeared in the skin discharging a thin watery pus. Patient ran afternoon temperatures with moderate amount of coughing and expectoration in the mornings. She also complained of stomach trouble. A diagnosis of scrofuloderma was made and the patient began the usual form of treatment.

The swelling subsided after the X Ray treatments, but the skin involvements became more extensive the sinuses soon widened into ulcers superficially with the irregular contour, undermined edges and grey necrotic base which is typical of the scrofulous ulcer. The condition in the patient's lungs improved quite rapidly under the general treatment but while the ulcers healed



Figure 6

over on one or two occasions they soon broke down again with more extensive skin involvement. The Wassermann test was negative but mainly from certain clinical symptoms which the patient had and for the reasons that I enumerated above we abandoned our physical treatments and began mercurial incisions. We also used Ung Hydrarg Ammon 5 per cent directly to the ulcerating glands. The lesions quickly healed leaving only a slight scar. (See Fig 5)

Case No 4—E B—Male Age 38 years Family history unreliable. States no tuberculosis cancer or insanity in family. Married. Three children aged 3 11 and 14 years respectively. Entire family called at office for examination. The mother was suffering from a generalized tuberculosis with partial involvement of both lungs and marked bone and glandular involvement. All three of the children were scrofulous with running ears, huge tonsils and adenoids enlarged cervical glands and most of the other symptoms seen in scrofulous children. The father had

all of the symptoms usually seen in chronic phthisis. He came to consult me regarding a skin infection which was limited mainly to the face and neck and the back of the hands (See Fig. 6). The history of onset was typical and is of interest inasmuch as it calls our attention to the early belief of the etiology of tuberculosis *verrucosa cutis* when many of the physicians thought that it originated from contact with animals or animal products. The patient stated that he had performed an operation on a ewe who was unable to give birth to her lamb. He failed to cleanse his hands at the time and recalls rubbing his hands over his face and neck. He claimed that he noticed a slight itching on the neck at that time. Some days later the patient does not recall how many, the eruption appeared and was followed by a swelling in the neck which proved to be lymphatic glands that were infected secondarily to the superficial infection. However this man was coughing and expectorating quite freely and there is little doubt in my mind that he infected himself by secretions from his own mouth. The skin infection was quite evidently of a mixed type and it was hard to decide whether the tuberculous infection was primary or whether it occurred secondarily to some other skin infection caused from his scratching the skin while his hands were in an extremely insanitary condition. The tuberculous features of this case, however were greatly in preponderance and a diagnosis of tuberculosis *verrucosa cutis* with secondary involvement of the cervical lymph glands was made.

With the establishment of the diagnosis, there yet remains for the physician to decide what method of treatment is applicable to the condition. Unfortunately many patients are prejudiced to the use of physical agents in the treatment of certain conditions and especially that of tuberculosis. People have been led to this belief by physicians many of whom honestly believe but without proper cause that the air and sunshine of such states as Colorado, Arizona and New Mexico have a specific effect upon tuberculous conditions. There is little ground for this belief and statistics will show that more people die of tuberculosis in these states than in some of the more thickly populated districts. This is due perhaps to some extent by the migration of tuberculous individuals into these so-called health centers.

Another unfortunate condition which prevents many patients from taking proper physical treatments such as are produced by electrical apparatus is that they have already had some ex-

perience with what they thought to be regular treatments of that nature. Many have gone to some physician, who possessing an electrical cabinet, usually of the "cracker box" variety and very limited in therapeutic value, has promised the patient a cure and has continued to treat him, until becoming disgusted, he has refused to take any more treatments. In the meantime, however, the unfortunate patient has not only wasted his time and considerable money, but has also become prejudiced against a system of treatment, which, if properly given, would probably have relieved if not entirely cured, his malady.

When we become convinced that we are treating tuberculosis of the cervical glands, we know that such physical agents as diathermy, the X Ray, and the ultra violet ray are indicated the question for the physician to decide is which modality is especially indicated in the specific case.

In superficial or surface lesions such as tuberculosis verrucosa cutis, the application of the air-cooled ultra violet lamp is indicated. If there is much crusting or thickening of the epidermis the water-cooled ultra violet lamp and, occasionally, superficial doses of X Ray are also indicated. There is no indication for diathermy. However, where the involvement is deep seated and primarily within the glands of the neck, the X Ray and diathermy become paramount in importance. There is a belief among many physicians that the X Ray and diathermy are physiologically opposed. Many think that the High Frequency current tends to offset the work done by the X Ray. This may be true to a certain extent however I claim that the two work very well together in tuberculosis the X Ray tending to break down fibrous tissue as well as affect the endothelial lining of the vessels, which are quite scarce in tuberculous conditions. In addition to this diathermy brings healthy blood into the diseased area. This freshly oxygenated blood contains not only nutrient material which stimulates the normal tissue but also, phagocytes and bacteriolytic enzymes which tend to clean up the infection. Diathermy and the X Ray work in perfect harmony in the treatment of tuberculous conditions.

Where deep and superficial infections are combined we cannot do so much with diathermy and in these instances the X Ray and quartz lamps should be used. I will report a case where the unfortunate misapplication of a really worth while modality caused a patient to become prejudiced to all forms of electrical treatments afterwards refusing to have electrical appliances of

any nature used in his treatment and continuing into a virtually incurable stage. The proper use of physical agents in the beginning would not only have corrected his condition but would probably have made him just as much a booster for such therapeutic measures as he is now the opposite.

Case 5 C S—Male Age 43 years Family history Mother had suffered from scrofula. Also history of running ears tonsilitis and enlarged cervical glands in three brothers one of whom has recently died from a general tuberculous infection Previous history unimportant. Usual diseases of childhood.

Following an attack of sore throat and influenza about one year previous to entrance at clinic, the patient observed a swelling about the size of a hen's egg in the anterior carotid triangle. He was treated symptomatically for a number of weeks without benefit. He then went to a physician who promised to cure the condition very speedily and he received daily ultra violet irradiations over the face and neck for a period of months. The only apparent effect being the erythema produced by the ray. During this period a sinus appeared in the neck and discharged a thin sero-purulent secretion which was quite definitely tuberculous. The sinus led down to the infected glands underneath and gradually widened into a deep-seated ulcer with considerable tissue necrosis and retraction due to the resultant fibrosis. The infection which had been limited to the glands soon spread to the ramus of the jaw with ultimate bone necrosis (Fig 7).

This was the condition of the patient when he applied at this clinic for treatment. He positively refused to allow us to use physical agents of any kind. He also refused to submit to a surgical operation but insisted that the condition be treated with external applications and



Figure 7

sterile dressings. After a time he permitted us to curette out the sinus and use antiseptics within the necrotic portion of the jaw. He has now been receiving treatment at this office for a number of months without improvement. In fact, the condition has progressed to the point where only a radical surgical operation combined with both physical and medicinal measures may effect a cure. Even then, the patient will be compelled to carry an unsightly scar through life which could have been avoided if proper therapeutic measures had been instituted in the beginning.

As this condition was limited to the cervical glands, with no involvement of the skin in the beginning, there was no indication for the local use of the ultra violet ray, which, as is well known, has only slight powers of penetration. From experiments carried out by numerous physicians over the country it appears that the ultra violet ray does not penetrate deeper than perhaps a fraction of a millimeter below the surface of the skin. It is also true, that from forty five to sixty-eight per cent of the rays given off from the air-cooled ultra violet lamp is made up of infrared and luminous rays, both of which have strong penetrative powers. These of course would produce a very slight deep-seated effect; however the ordinary deep therapy lamp gives off at least ninety-five per cent of these penetrative rays and would be approximately three times as valuable in the treatment of deep-seated conditions. As this case was limited to the deeper tissues the X Ray Diathermy and the radiant heat lamp were the modalities that should have been employed.

In such cases it is my custom to rely mainly on the X Ray and radiant heat treatments. Very often the glands will recede and almost entirely disappear without necrosis. This is very much to be desired. If the glands soften and it becomes apparent that necrosis is unavoidable the condition may be hastened to a successful termination by diathermy. This means excision and drainage. However when the condition is properly localized a tiny incision with a sharp lancet will usually suffice for free drainage and the incision will heal with little or no scarring. This is in marked contrast to the unsightly scars which result from the glands being allowed to break down with superficial sinus and ulcer formation.

Previous to the advent of physical agents in the treatment of tuberculosis of the cervical lymphatic glands the physician had his choice of three standardized methods of treatment:

First, what we might term the palliative treatment which consisted of the application of external antiseptics, of which Tr Iodine was the standard in an effort to absorb the glands secondly the application of poultices and hot fomentations in an effort to break down the glands with pus formation and lastly radical surgery

In the majority of these cases the patient passed through several weeks or months of more or less acute suffering until the glands became necrotic sinuses formed and the pus was discharged through the skin This always meant a more or less protracted period during which the necrotic glands were discharging and where healing took place there always remained the unsightly scars which invariably followed conditions of this kind Fortunately many of these patients consulted the surgeon early and the process was incised as soon as pus formed, thereby evacuating the pus with a minimum amount of skin involvement which greatly limited the formation of scars In many instances however these glands did not become necrotic but the process spread along the entire cervical chain with the formation of a huge irregular mass sometimes extending from the temporal region to well down into the mediastinal space Such conditions required radical surgery and often resulted fatally Physicians who have performed this operation or who have seen it done will appreciate the absolute futility of attempting to remove all the lymphatic glands by operation The only thing that the physician can hope to accomplish is to remove the majority of the larger diseased glands and establish drainage hoping that the remaining lymphatics will either be absorbed or necrose and discharge through the incision

Before taking up the use of physical agents in the treatment of tuberculosis I performed a number of these operations I invariably found that the large vessels of the neck as well as important nerves, were firmly embedded within the mass and that it was impossible to make a block dissection such as is described in text books I was never able to remove all of the glands and seldom found the operation entirely satisfactory either from the surgeon's or patient's view point In one or two instances some of the larger vessels were so embedded within the tuberculous mass that extensive ligations were required In another instance a temporary post operative aphonia was caused by traumatism of the recurrent laryngeal nerve and in all cases a secondary infection with sloughing and prolonged drainage

resulted from the traumatism of the tissues and a dissemination of the infection from the diseased glands. In one instance a terrific hemorrhage occurring several days after the operation was caused by a sloughing of diseased glandular tissue which was so firmly embedded within the wall of the jugular vein that its complete removal was not possible at the time of the operation.

By reading the brilliant reports of a few surgeons who consider operative work entirely from the technical point of view and do not take into consideration the after effects or the condition in which the patient is left and also by a study of diagrammatic operations as outlined in text books, the novice may readily be lead to believe that an operation for cervical tuberculosi s is a very simple matter, but a little experience would certainly dampen the ardor of the most enthusiastic internist or conscientious surgeon and cause him to exhaust all other measures before attempting such surgical procedures. Even where the patient survives the operation the least that can be hoped for is a more or less extensive scarring (See Fig. 8, which shows the site of operation of a case of cervical lymphatic tuberculosis wherein the operation was as nearly successful as usually occurs in such cases.)

This case is of interest because it was diagnosed Hodgkin's disease by various surgeons and also by the pathologist of one of the leading medical universities of this state. The history of the case is as follows:

CASE HISTORIES

C. L. S.—Female White Age 30 years two healthy children husband in perfect health. Following a spell of influenza the patient complained of more or less throat trouble for a period of three or four months during which time the lymphatic glands were palpable in the anterior carotid triangle. It was naturally supposed that the glands were caused by the infected tonsils consequently the patient had the tonsils removed. The lymphatic glands however continued to swell until the patient presented an indurated mass which extended from about the level of the ear to the infraclavicular space. This mass was tender to the touch and caused the patient considerable pain.

She was taken to one of the large hospitals in Kansas City where a piece of the gland was removed for microscopical ex-

amination A diagnosis of Hodgkin's disease was made She was even taken before a class of physicians and demonstrated as a typical case of Hodgkin's disease Her husband was a dentist a very intelligent man and desiring that no stone be left unturned he attempted to call in men who were considered authorities in the medical world but in the end the patient was returned to her home to die being told that she had an incurable malady and that it had already advanced to the point where nothing could be done for her At this time the patient was having chills and running a high temperature The incision where the gland had been removed was discharging a thin watery pus and the patient had all of the symptoms of acute inflammatory disease I still held to my previous diagnosis of tuberculosis of the cervical lymph glands and advised operative procedure A slide was sent me by the pathological laboratory in Kansas City which further confirmed my diagnosis This slide was devoid of the typical Hodgkin's cells and showed areas of caseation As it was plain that the patient would die unless something radical was done both she and her husband consented to the operation The operation was performed with an apparently complete recovery



Fig 8—Showing scar following operation for tuberculous cervical lymph glands

As mentioned above it was impossible to remove all of the glands surgically and it was some months before the process ceased to drain Furthermore certain nerves were involved producing an atrophy of muscles of the neck By referring to (Fig 8) one may get some idea of the unsightly scarring which results from operations of this kind.

In contrast to this I present Fig 9 which shows the unbroken

skin and perfect contour of the neck wherein the glands have been reduced by physical agents of which the X Ray is perhaps

the most important and demonstrates very plainly the advantage of these modern physical methods over the time honored operative procedures.



FIG. 9.—Showing advantages of physical measures over operative measures. ** Scarring.

quent symptoms. It is my hope that a more extensive knowledge of the value and application of these physical agents will soon entirely eliminate what is now considered the standard treatment. Had I known the value of physiotherapy at the time that this operation was undertaken I could have saved myself a great deal of work and anxiety as well as the patient a vast amount of suffering and the unsightly scar that she will carry through life.

SUMMARY

In concluding this series of articles on tuberculosis of the cervical lymph glands I wish to again call attention to the advantage of physiotherapy over other forms of applied treatment.

1. The condition is eliminated by a natural process and without pain or discomfort to the patient.
2. The process most usually disappears by absorption and requires no surgical procedure.

- 3 In late cases where necrosis and sloughing has already taken place it is possible to sterilize the field and limit the infection more quickly and effectively than by any other method of treatment.
- 4 It shortens the duration of the disease
- 5 Radical surgery is eliminated
- 6 Scarring is prevented or reduced to a minimum
- 7 The recovery is complete

It is hoped that with a better understanding of the indications and advantages of physical measures by physicians and its application in the early stages of such conditions as cervical tuberculosis that all indications for surgery will be eliminated and many thousands of sufferers will be restored to health and saved the humiliation of carrying unsightly scars or discharging sinuses throughout life

SOURCE OF INFECTION

In connection with our discussion of tuberculosis of the cervical lymph glands it would not be amiss to make a few remarks relative to the source of the infection or, we might say the port of entry of the infective agent into the lymphatic system.

In cervical lymphadenitis there can be no doubt that this is via the lymphatics of Waldeyer's tonsillar ring which includes the pharyngeal the palatine and the lingual tonsils. Unless tonsillectomy has been performed we can almost invariably trace a connection between a previous tonsillitis and the enlargement of the cervical lymph glands. Where the palatine tonsils had been removed we could by careful questioning elicit a history of pharyngitis in which case the port of entry was through the lymphatics which drain the adenoid tissue within the roof of the pharynx.

In the majority of cases seen during the acute stage the primary focus of infection was in the naso-pharynx with secondary involvement by extension of the posterior pharynx, the palatine tonsils and often the Eustachian tubes. The cervical lymph glands of the anterior carotid triangle were usually palpable at this time but except where tuberculous the swelling quickly subsided with the cessation of the acute symptoms.

When tuberculous lymphadenitis developed the swelling usually appeared some days or weeks after the disappearance of

the acute symptoms and persisted regardless of the usual symptomatic treatment. There are two possibilities as to the origin of the tuberculous infection first that tubercle bacilli found their way from the excoriated mucous membranes of the nose and throat into the lymphatics in the manner just described or else that latent tuberculous foci were allowed to flare up and develop account the lowered tissue resistance caused by the absorption of toxins from the acute pathogenic infection in the naso-pharynx. Both of these conditions were encountered many of the patients presenting themselves for treatment with old discharging sinuses or healed scrofulous ulcers while others showed absolutely no evidence of a previous tuberculous infection.

Frequently the X Ray or physical examination revealed the presence of tuberculous foci within the lungs where there was no history of a previous adenitis. These foci were, of course potential sources of infection either via the blood stream or by the depositing of tubercle bacilli upon the mucous membranes of the throat. I have also wondered if many of the acute respiratory infections were not primarily tuberculous with a preponderance of symptoms produced by the many and varied saprophytic microorganisms that are always present within the nose and throat and that invariably become virulent when the resistance of the tissues are lowered by any cause whatsoever.

When we stop to consider that one out of every five persons that we meet in our daily walk thru life have tuberculosis in the acute stage this latter hypothesis seems very probable.

Accepting as granted that the adenoid tissue of the naso-pharynx acts as the point of initial infection invariably preceding cervical adenitis the question immediately arises whether or not our treatments should not be directed at such source of infection rather than at the glands themselves also that even though the glands may appear cured for the time being if the source of infection remains will they not inflame again with a repetition of the disease. In reply to the above question I would say that unless some treatment is directed towards the source of infection that there will be a recurrence of the adenitis. It is true that the X Ray does affect normal lymphoid tissue and probably by the increased fibrosis makes the glands less liable to recurrent infection however I have had the glands of the neck to inflame in series. It is very disconcerting after having successfully treated a tuberculous cervical gland to find another developing in close proximity to the one just treated but if the source of

initial infection persists that is exactly what will occur. This is proved by the fact that the subsequent lymphatic swellings usually occur nearer the initial source of infection than the ones first treated that is if the drainage is from the naso-pharynx the swollen glands may first appear in the anterior, inferior carotid triangle with subsequent recurrent infection gradually ascending along the border of the sterno-cleido-mastoid muscle. The reason of this is because the inflammation has sealed the lymphatics beyond and only the glands proximal to the source of infection which escape in the beginning are open to infection. The question now presents itself as to what method of treatment may be directed towards the pathological condition in the naso-pharynx.

TREATMENT

We are all familiar with the usual method of treating infections of the naso-pharynx. Frequently where the infection extends into the frontal ethmoidal or sphenoidal cells of the nose a radical cutting operation is necessary. Where the palatine tonsils are involved it is often more advisable to shrink these down by the use of the X Ray and surgical diathermy than it is to remove them with the knife or tonsillectome. Almost all of these cases present what they call a chronic catarrh and even after the tonsils are removed the symptoms will persist.

I am treating at present a large number of these cases where the only demonstrable pathology is a thin secretion which drips from the naso-pharynx and keeps the throat just inside the posterior pillars red and excoriated. In connection with this there is usually a swelling of the inferior turbinates with some interference to the free passage of air. Any clinician will see that the removal of a section of the turbinate by the old cutting type of operation would result in an extension of the infection. Furthermore any surgeon who has had experience with removing turbinates can appreciate the amount of discomfort to the patient the huge amount of hemorrhage invariably encountered and also the difficulty of obtaining satisfactory results. Even when the operation is performed with a minimum amount of hemorrhage and discomfort to the patient there is invariably a huge amount of crust formation and swelling in the nose which persists for weeks in spite of all therapeutic measures.

Appreciating these difficulties I have devised the following operation which has proven highly successful in my hands.

TECHNIC

The turbinates are anesthetized by applications of a 10 per cent solution of cocaine. Some of the other synthetic preparations such as butyn may be used if desired. Then, using a needle electrode which is insulated to within a quarter of an inch of the point with the machine set to deliver a spark that will jump not over three-quarters of an inch to a ground, and using the foot switch the current is applied to the hypertrophied turbinate until the area which is to be reduced appears white. This may be done with a minimum amount of discomfort to the patient. Within a few days the coagulated mucous membrane and submucous tissue sloughs from the turbinate and healing begins. This is completed within a few days and the turbinate remains permanently reduced and there is not the disastrous effects which invariably follow the cutting operations, which, I am glad to say have already fallen into disrepute. By employing this method of reducing hypertrophied turbinates, by opening and draining purulent sinuses and by reducing or eliminating infected adenoid tissue of the nose and throat by the X Ray and surgical diathermy we may completely irradiate the tuberculous infection of the nose and throat. When this is done we have completely removed the port of entry or I should say, source of infection of tuberculous lymphadenitis and with the irradiation of the cervical infection we may confidently expect the cure to be permanent.

Another advantage which is gained is this. These patients are all markedly susceptible to upper respiratory infections of all kinds but after the above mentioned treatment they find that their resistance has been increased and they often enjoy absolute freedom from colds LaGrippe and similar respiratory infections.

Physiotherapy in Surgical and Post-Surgical Conditions

By Disraeli Kobak, M D

Our experiences since the war have taught the world of medicine that electrical and radiant modalities can be scientifically applied in definite measurable quantities and qualities, both medically and surgically. Perverted function whether local or general can be restored to a higher degree of normality when physiotherapy is added to our other known measures. On the other hand, to decry the proven therapy of orthodox medicine and to laudate the physical as a panacea is not in keeping with scientific experience. Best results will be obtained by combining and co-ordinating all the proven measures of medicine with that of electricity.

As the uses and utility of physical therapy become better known and understood, the frontiers of prognosis and sequelae will be further extended and broadened. The surgeon internist or specialist of today can conscientiously offer brighter prognosis in innumerable cases when physiotherapy is a part of his armamentarium.

It is surprising with what rapidity myostic dystrophies such as wasted and flabby muscles regain their tone and bulk by a daily or thrice weekly application of radiant light and sinusoidal massage. The prevalence of atrophied condition from disease is readily attested to by turning back the bed sheets of most any bed ridden patient in any hospital. By maintaining the muscle nutrition of the patient in the manner recommended the time of his convalescence is materially reduced. In women following child birth daily sinusoidal massage is a fair guarantee against uterine displacement, intestinal stasis and pendulous abdomen. This treatment is mobile in nature and directed to the anterior abdominal wall and to that large lateral and oblique muscle the *externus obliquus abdominis* whose influence in maintaining the integrity of the abdominal wall and viscera has been much overlooked.

The usual technique is radiation by deep therapy lamp with 1500 watt light over the wasted musculature for twenty minutes followed by a ten minute rapid sine current, mild in contraction with a larger indifferent pad over the sacral or cervical region and the active pole over the affected parts.

In acute myostis whether traumatic or rheumatic in origin diathermizing the affected part with parallel or lateral plates gives the quickest results. Lateral or longitudinal plating carries the heat more superficially and by conduction hence it reaches the inflamed structures more readily. The dosage in milliamperes depends as usual upon the size of the electrodes and the sensitivity of the patient. Anesthetic parts should receive due care and consideration.

Torticollis or wry neck of the muscular or neurotic type in the acute stage practically yields with the first treatment of a combination of radiant light for fifteen minutes plus diathermy for twenty. The technique that has found most favor under my service is a semi-circular strip of metal over the unaffected side of the neck and a larger and similar type of metal over the acromial end on the affected side. The conversive and convective heat sedates and relieves the muscular spasm.

On the other hand the chronic and paralytic types yield more slowly but very definitely to the combined measures of diathermy negative surging galvanism, and weekly ionizing X ray treatments to the affected parts. In these latter types it is a question of prolonged muscle education of the sternomastoid trapezius and the deep posterior cervicals. The fibrolytic action of the ionizing doses of X ray the maintenance of nutrition by diathermy plus the softening and stimulating action of surging negative galvanism are the methods of choice.

Lumbago now regarded as a hypertonic state of the lumbar muscles readily yields to the conversive heat of diathermy and the Morton wave or sine current or the counter irritating sparks of the non vacuum or vacuum glass condensers. We personally prefer the non vacuum type for its deeper penetrating powers if we are to use the glass condensers. By diathermizing the affected region with antero-posterior plates to the point of about 1500

milliamperes for forty minutes, and followed by sine or Morton wave the results are fairly startling in their beneficial effects. There are indeed few conditions which enable a physiotherapist to impress his patient so quickly with the curative power of electricity as that of lumbago.

The customary technique is a 2x10 inch electrode posteriorly and a 10x12 anteriorly. The patient, in a recumbent position, face down and the electrodes properly applied and held in place with suitable elastic bandages. It may also be appropriate at this point to include the longitudinal plate technique in affections of the spine. The latter has greater skin affect and materially heats the spine by conduction. Place one electrode size 4x4 over the cervical region and the other 5x8 over the sacrum, patient in recumbent position face downward.

In sprains or strains of muscle of the joints of the long bones the value of physiotherapy can be quickly demonstrated. After ruling out the question of fracture by X ray the method of choice is diathermy via the cuff technique. The cuff method should be the one of preference because the nature of the injury is primarily one of soft tissue trauma with a secondary involvement of the capsule and cartilage. By using cuffs the diameter of which is one-half the thickness of the injured part we insure superficial as well as depth penetration throughout the traumatized parts and an equalization of heat between the electrodes. Furthermore, the decompressor action of convergent heat stimulates and acts upon the efferent circulation to remove the increasing effusion of the part as well as to relax the musculature and to sedate the local nerve injury. In association and following the diathermy treatment immediate application of the rapid surging sinusoidal current or the static machine with the Morton wave is of utmost importance. The well-known compressor and contractile qualities of the foregoing rhythmic currents tend to remove the extravasated fluid and swelling and to tone up the injured parts. Progressively the pain, swelling, numbness and stiffness, which are the cardinal symptoms of this condition will disappear in direct ratio to the rapidity with which treatment is instituted. Moreover the customary troublesome sequelae of organized adhesions, fibrosis or ankylosis,

will be nullified to a great degree. A word of caution may also be added in the treatment of sprains. Although the pain and swelling may have disappeared within a week or less, it is advisable to consider the injury as undergoing a period of convalescence in that the limb should be guarded against undue or excessive activity for at least a period of two to three weeks.

Contrary to the usual laudatory opinions of many physiotherapists in the results obtained in cases of arthritis, our results have been variable from the point of extreme satisfaction to that of keen disappointment. While true that in all of the arthritides electro-therapeutic measures offer immediate alleviation of the symptoms involved, our experience has been that the relief in the toxic polyarthritic types is merely of a transitory nature.

The migratory tendency in the sub-acute toxic type does not lend itself to an early eradication of all symptoms with physical measures unless used in conjunction with other known measures such as removal of focal infective points, proper diet and complete elimination by drugs or other methods. Each treatment, however temporarily relieves the painful parts and symptomatically the patient acknowledges beneficial effects.

On the other hand, it is with a sense of satisfaction that we can attest to permanent relief in the arthritides of the Neisserian type. Heretofore infective joints following specific infection have been the bane of the urologist. They have yielded as little with, as without serums, vaccines, and drugs.

Diathermy is a potent remedy in these conditions when applied alternately over the prostate and to the affected joint. Raising and holding the degree of heat within the peri-prostatic and the peri-articular tissues from 106 to 114 degrees F is of the utmost importance, for the diplococcus is definitely destroyed within the range of heat advocated above. The inflamed tissues are concomitantly benefited and the patient recovers rapidly.

Many old cases of "water on the knee" appear to be due to a weakness or loss of tone of the muscles in the quadriceps extensor group. The intra-synovial pressure is in such cases

lowered with the consequent persistence and accumulation of fluid. The clear indication is to re-develop these weakened muscles and thus restore the normal pressure within the joints and the disappearance of excessive fluid. The treatment should be divided between diathermy cuff method and the surging galvanic negative pole over the quadriceps extensor and vastus intermus groups of muscles.

Some of the best results yielded by electrotherapy are obtained in chronic rheumatism with the triple method of chlorine ionization diathermy and the surging wave current. Chlorine ionization has found its most enthusiastic advocates in the French and English schools. Its utility in fibrositic joints and scar tissue affections has been demonstrated especially by Leduc of France. The polar effect of the continuous current carries many useful possibilities not only in chronic arthritis, but also in many of our specialties. I mention the successful treatment of otorrhea with ionization as an example. In treating chronic rheumatism apply diathermy by the plate method for twenty minutes then follow with chlorine ionization by wetting a layer of four to six thicknesses of cotton in a two per cent solution of sodium chloride as warm as the patient can stand. Treat with the negative pole gradually advancing the amperage to the reading of 60—80 milliamperes for about forty minutes gradually shut off the current and follow by a ten minutes surging sine to the vastus intermus and extensor femoris group of muscles. The ionization should be given at least once a week and not more than twice a week. The diathermy plus the rhythmic current should be given either daily or every other day.

In osteomyelitis following the removal of the sequestrum diathermy by the plate method, alternated with the air cooled actinic lamp is practically specific. We have observed many cases that have come into our service with the poorest sort of prognosis get well under this combined therapy. It is also surprising with what certainty function is established regardless of what the prognosis appears to be at the outset.

In tubercular glands of the neck the foregoing combined therapy is also of marked value, save that frequently the water-cooled actinic lamp replaces the air-cooled. Whether

the influence of the combined therapy is based on any obscure phenomena, we are not in a position to state. We do know that the action is both local and systemic, and that the entire body metabolism is called into action.

Electrocoagulation is a bipolar technique with the active electrode in intimate contact with the neoplasm and a metered D Arsonval current to measure the necessary amperage. Electrodesiccation is a unipolar application which does not require a metered reading because it is dependent upon an extremely low amperage current.

In coagulation, the destructive or surgical effect is obtained by high amperage converted into destructive heat within the neighborhood of the small button like or needle-point electrode. The intense heat coagulates the protoplasmic and cellular structures, cooking the tissues within the vicinity of the active pole. On the other hand, the desiccating effect of the monopolar current leaves the treated tissues in a dehydrated state, microscopically resembling a state of mummification or dry gangrene.

In proctology fissures, ulcers hemorrhoids yield promptly to the dehydrating effects of this current. In fact, desiccation and coagulation are the methods par excellence in all accessible, benign and malignant surgical lesions involving cutaneous surfaces, mucous orifices and osseous structures.

Some of the benign conditions suggested for treatment with the foregoing methods are papillomas, fibromas, lipomas, sebaceous cysts, simple or pigmented moles, nevi, tattoo and powder marks, angiomas lupus chancroids of the fulmenating type, tuberculous or other ulcers leukoplakia, erosions of the uterine cervix, Paget's disease, chondromas exostosis pterygium, leukoma, surgical tonsils in adults.

The small, accessible malignant neoplasms of the basal or squamous cell type yield very readily to desiccation. Under local anesthesia, epithelioma of the face is brushed or sparked over with an ordinary needle attached to a suitable handle or foot switch. The growth becomes dry hard and horny in texture, in the space of a few minutes. After the lesion has healed, it is advisable to follow with a pro-

phylactic dose of X ray. The cosmetic effect is excellent as no scarification follows the dehydration method.

In the more advanced accessible malignancies such as epithelioma of the body mouth or tongue coagulation offers the best results where complete destruction or amputation is desired. The procedure is the same as in any other major operation. The etherization of the patient is preceded by an injection of $\frac{1}{4}$ gr morph. and 1 100 gr hyoscin, $1\frac{1}{2}$ hours and again three-quarters of an hour prior to operation. Ether or chloroform inhalation is given up to the time of the actual operation and then stopped. Important blood vessels should be tied off before coagulation takes place within their vicinity so as to prevent secondary hemorrhage.

The patient lies in a large, indifferent electrode which is in complete contact with his skin—this is best accomplished by soaping the electrode and skin first and holding together by a large elastic bandage or towel. Further requirements are a mouth gag a good light, rubber or wooden tongue depressor a stout catgut ligature through the tongue for retracting purposes a good foot switch and a flexible apparatus. Upon the coagulation of the tumor the dead mass is either curetted away and carbonized, or completely removed with the knife-like electrode at the active pole. Dakin's solution is applied post-operatively for the purpose of preventing or checking bacterial invasion. The lymphatics within the surgical region should be irradiated by proper X ray dosage whether metastasis is present or not. It is difficult to suggest accurately how much heat or milliamperage to give to each case. Generally speaking the smaller the active electrode the less the milliamperage required. On the other hand the larger the mass the greater the milliamperage. The instrument must be flexible enough to give from 600 to 2000 milliamperes.

What are the advantages with this modality? If the knife can accomplish the same results and expeditiously why the surgeon will ask shall we trouble ourselves with a new and expensive technique? Points of advantage not demonstrated by the experience of those familiar with this technique answer the question.

1 Immediate destruction of the neoplastic cells in situ

- 2 The carrying of the heat, by the current, to a depth in the tissue beyond that actually treated, thus assuring the destruction of any malignant cells which have been lying beyond the area which actually appear to have been involved—a selective action as it were.
- 3 The practical elimination of either primary or secondary hemorrhage, as the blood vessels are thrombosed beyond the area of destruction
- 4 There is practically no risk of spread of metastatic elements through either the blood or lymph channels.
- 5 The minimum formation of contractile connective tissue.

Further advantages were enumerated in a recent paper by George M. Wyeth. They are Alleviation of pain practically no surgical shock accuracy of dosage, because the current is under absolute control of the operator and the sterilization of wound incidental to treatment.

The Economic Value of Physiotherapy

By Emile C DuVal, M D

It is pretty hard to estimate the value of physiotherapy in industrial cases. Some years ago industrial cases were left to their own method of treatment when they were the subject of injury. The advent of the Compensation Act in this state and various other states has made it incumbent upon the employer of the injured man to furnish him with the necessary treatment until such time as he is in position to resume as nearly as possible the work that he did before. Physiotherapy in industrial cases has come into its own since the advent of the Compensation Act.

Of course, to be successful in treating industrial cases, and incidentally your own private cases it is necessary to understand fully the pathology existing and to understand thoroughly the modalities to be used and the way they are to be applied. Doctors have come to me from time to time and have said, 'You have had results of so and so in such and such a case. How did you get them? I have had similar cases and have had no result.' The doctor understood his pathology he knew what was existing there, but the faulty application of the modality that he was using was the cause of his non success. Nobody expects anything miraculous of physiotherapy but we do know beyond the possible shadow of a doubt that we can attain certain things that we cannot by medicine or surgery we can attain these things by physiotherapy.

A better way perhaps to illustrate the economic value of physiotherapy is to cite a case or two. About three years ago I was called to examine a case by the General Accident Company. This man had had a staphylococcal infection in his hand. The infection had been overcome and the sequela usually attendant upon such a condition was existing here. Later it transpired that a very eminent physician who has written considerable literature on surgery examined this man's hand for the insurance company and he told them that at that particular time the man's hand was absolutely useless, that perhaps in a period of two years he might attain ten per cent functioning of the hand.

I happened to be in this Company's office examining another case and they referred this case to me for examination to see if anything could be done to restore at least some function to the man's hand. There was no swelling any more in the hand, but the fingers were in absolute full extension close together the thumb adducted to the palm of the hand. There was no movement voluntarily at all in those joints of the fingers. There was a little movement of passive motion at the metacarpophalangeal articulation.

I had had experience with a case somewhat similar to this a short time before and had obtained a fair result. I informed the man who turned over the case to me for examination that I thought perhaps I could eventually give this man fifty per cent use of his hand. He said, "You take the case and treat it." At this time I had not heard anything about the report of the physician who had examined the case before.

We gave this man diathermy every day, followed by manipulations for a period of about three months. At the end of three months this man closed his hand down voluntarily so the tips or the ball of the fingers came down on the palm of the hand in this fashion. I discharged the man telling him that active use of the hand would restore full function quicker than treatment might. Instead of the insurance company paying him for the full loss of the use of the hand the man returned to his work and came back to me again in three months after that with full function of the hand.

There are a number of cases that I could cite to you similar to that, and these cases can be verified. An insurance company must know the facts because they are paying for any deformity or any limitation of function that exists after you get through with the case.

There is one thing that I would like to impress upon you. If a case does not respond to treatment in the first two or three weeks, do not be discouraged. We are handling at our office at this time perhaps twenty five cases a day in physiotherapeutic measures. The majority of these cases, where the injury has been somewhat serious or where there has been a deep-seated infection and again on condi-

tions where there is a bursitis synovitis of the knee or bursitis of the elbow take perhaps from a week to ten days to begin to respond to treatment.

After that period of time they begin to respond very quickly in fact to such an extent that you would be agreeably surprised.

Another instance which I will speak of is one of an ununited fracture. I have reference again to the economic value of physiotherapy. It was a case of a fracture of the tibia at the juncture of the middle and lower third. It was referred to me by another insurance company. This fracture had existed ununited for a period of five months when I saw the man. That man had six weeks' treatment daily with diathermy and I got a solid union of that bone. In six weeks after that the man returned to work in a road construction gang his leg was healed by that time.

The man was referred to me originally by an insurance company at the behest of their chief surgeon who is also an eminent surgeon in this city. That particular man himself sometime ago came down to my office for a treatment. He came into my office one day with what he termed lumbago. I said, "There is no such thing as lumbago. You have a sore back. We will fix it for you."

We put him on the table and treated him. He left the office very much relieved. He said, "I am a believer from now on in this physiotherapy stuff. I think it is something mighty good."

The insurance companies are pretty hard headed people as a rule. Every dealing they have, of course, is a matter of dollars and cents to them. A number of these companies have established physiotherapy departments in their local offices. They have tried this thing and they have found it to be a very useful form of treatment.

Say for instance, we had a fracture of a bone in close proximity to a joint. The immobilization of the part to insure union of that bone naturally brought about more or less of a pseudo ankylosis in that joint. Before physiotherapy was brought into play that patient was allowed to go and do the best he could. The surgeon couldn't do any

thing for him Go and exercise your leg and do the best you can he told the patient. The result was that if he was a poor man he became perhaps a charge on the community for a certain period of time and if the condition was one that might develop into a permanent disability he might be incapacitated to a great extent for the rest of his life.

By the use of physiotherapy, function is returned, I will say without exaggeration in from one-third to one-half of the time that it would be without the use of physiotherapy. The records of the insurance companies today where you have had fracture, bursitis, synovitis, nerve involvement, in fact any kind of traumatic injury of any consequence, will show that where physiotherapy has been used the period of disability has been very materially shortened.

Certain surgeons in various parts of the United States have said that physiotherapy was of no use in certain conditions, for instance fractures of the long bones that when the bone was healed if there was no involvement of the joint, nature would restore the part and function as quickly as physiotherapy would. Can you imagine a part, even if you have a fracture of the long bone, say it is a comminuted fracture where you have a lot of induration in the soft tissues and impaired circulation being restored by nature after immobilization as quickly as if that part were manipulated and heated and nature were helped to a great extent by artificial means?

I believe that physiotherapy today is one of the greatest things that we have, one of the greatest branches of medicine. I have had a great deal of experience with it and I feel that the doctor who overlooks what he can do by physiotherapy some day is going to be a back number.

Some time ago I had the opportunity to try diathermy on a gall bladder case. I didn't make the diagnosis it was made by another physician. The case was referred to me then and I said, "We will try diathermy on it." This man after one application, while he was still in the office, told me he was relieved from pain the nausea that was attendant upon his condition was partly relieved. The man was more or less subject to chronic constipation and the follow-

ing morning he came back to see me again and told me the bowels had moved rather freely That man had four applications of diathermy on four successive days and he had no return whatsoever of the condition that existed when he first came to me

CHAIRMAN HENRY Our last speaker said that physiotherapy had come to stay I know you men are asking yourselves the question "Where in the world am I going to get any systematic training or education along this new field? You will be interested to know that the Medical Department of Harvard University has put in a course that in the Post Graduate School at the University of Pennsylvania they have put in a course of this kind and over the country they are holding clinics of from one to three days where you men can leave your work and go and just pick up a few things each time. You will have to begin in a small way and branch out into this new field If that is true it would be logical to expect that organizations where we can get together once or twice a year are going to be formed and such an organization has been formed of just regular doctors now who belong to their county and their state societies based on the regulation plans of the A. M. A. Such an organization I say has been formed and I want you men to know about it

I see Dr Tyler here in the audience and I am going to ask him to just tell you the name of the organization and how you can get in touch with it. If you care to join such an association just the same as you would your county society you will be very gladly welcomed

DR. ALBERT F TYLER I have been asked by the Chairman to make an announcement about the American College of Radiology and Physiotherapy This is an organization originally organized by a group of physicians who were interested in this particular class of work, and it is now having its third annual meeting at the Hotel Sherman Chicago November 12 14 As Dr Henry said the requirements for membership are the same as in the A. M. A Any one belonging to his county medical society and interested in physiotherapeutic methods or X ray or radium or all of these things can be a member of the society The annual

dues are ten dollars, which includes subscription to the official publication

The purposes of the College are high and are planned a great deal like the College of Surgeons All of you are invited to join

(Reprinted from *Physiotherapeutic Lectures Second Edition*)

Physiotherapy Treatment of Bone and Joint Injuries

By R. W. Fouts M.D.

Omaha Clinic, Omaha, Neb.

(Read before the Western Electrotherapeutic Association
Kansas City April 17 1924)

The treatment of any bone or joint injury will depend in a great measure upon the length of time that has elapsed between the receipt of the injury and instituting treatment.

In a case of injury in the region of the joint for example, the ankle which is a so-called bruise or sprain, what particular thing is responsible for the disability?

The pain of course but why so much excruciating pain when we may have only a slight tearing or laceration of the soft parts in this region? We are all aware that if we get but little swelling only a moderate or trifling amount of pain will be experienced and our conclusion is that the injury was only slight because there was but little swelling and pain. The seriousness of the original injury is usually gauged by the amount of pain and swelling. This however is fallacious.

The difference is in the amount of fluid poured out in the tissues in nature's effort to combat or limit the extension of the irritation. If nature is generous or over-enthusiastic as is sometimes the case and an excess of serum is poured out resulting in an extensive edema a proportionate swelling occurs with its consequent pain and disability. The edema of itself produces additional injury by laceration of the muscle sheaths and traumatizing the soft tissues.

From the foregoing it is evident that treatment should be instituted as soon as possible following the injury before the usual edema and swelling occur. However these conditions are no barrier to or contraindication for treatment but all agree that 'an ounce of prevention is worth a pound of cure' and that it would be better to prevent the edema, swelling and pain rather than wait till these symptoms are present and then attempt to relieve them.

Given a case of severe sprain of the ankle with immediate extensive swelling and consequent pain how shall we proceed?

First a thorough examination which can be made only with the X-ray. A fluoroscopic examination will not suffice. Pic

tures must be taken in both planes or better still, if taken stereoscopically

Fractures will be detected many times with this kind of examination that would otherwise be overlooked.

The presence of a small fracture makes no difference so far as treatment is concerned, but it is a mighty good thing for the physician to know, particularly if for any reason the case should pass out of his hands and the patient later be apprised of the fact that he had a broken leg.

Our effort in the treatment of a case of this kind is toward the relief of pain and we do this by relieving or preventing the one thing that is causing the pain—the edema. This is accomplished by the use of diathermy after the following technic.

If the pain is not so great that the foot cannot hang down, it is placed in a basin of salt water and a combination of the cuff and salt water electrode method is employed the cuff being placed well above the ankle on the calf of the leg care being taken that the cuff is only tight enough to insure contact and it must be loosened and reapplied from time to time during the course of treatment, which should last thirty minutes to an hour. If the cuff is not loosened it will become a constriction and an impediment to the return circulation within a few minutes after the treatment is begun. The electrodes may be applied laterally if so desired but the combination method if it can be employed seems better. The greatest amount of heat is produced at the point where it is most needed and the efferent vessels higher up the leg are dilated favoring the return flow of the lymph.

Another factor which contributes to the pain in a great measure is the spasm of the muscles. The sedative action of diathermy relieves this by relaxing the muscle spasm. The efferent lymph channels are opened and edema and swelling are prevented if treatment is instituted early or is quite promptly disposed of if present. During the treatment and for a few minutes following gentle massage from below upward will materially assist in the process.

After treatment the limb is covered with a thin layer of cotton an extra layer being placed below the malleoli, and an elastic bandage applied from the toes to the calf of the leg. The limb is kept elevated and in six hours the treatment is repeated.

With the edema and swelling eliminated the pain is reduced to a minimum and is of small consequence.

With the edema and swelling held in check for 36 to 48 hours the ankle may be strapped with adhesive tape after the usual fashion and the patient walks with but little pain or inconvenience.

What has been said about treatment of sprains applies equally well in the treatment of fractures providing the fracture is of such a nature as to admit of this form of treatment.

For illustration let us take a fracture of the forearm. After the fragments have been properly reduced our efforts should be directed toward preventing edema and swelling.

If the injury is such that it may be treated in this manner diathermy may be given by the application of metal splints applied directly to the forearm extending well up to the elbow. After a thirty to forty five minute treatment the muscle spasm is relieved the efferent channels are opened and edema and swelling reduced to a minimum. With these conditions relieved the pain is of small consequence. The part is kept continually elevated during the treatment and for 36 to 48 hours following. Treatment may be repeated three or four times during this period after which a plaster cast or whatever form of splint desired may be applied and the patient become ambulatory.

This treatment has to its credit not only lessened pain during the first few days but the distinct advantage of eliminating the additional trauma produced by the edema and the resulting fibrosis of the soft tissues after healing has taken place.

We have many times been impressed by the conditions often encountered upon removing a cast or splints after four to six weeks. The flabby atrophied muscles in some cases, while in others the partial loss of function due to fibrosis of the muscles and the difficulty encountered in restoring this function.

This condition may be overcome or prevented if proper treatment is instituted. The muscular contractions elicited by the early electrical stimulation enable the muscles and tendons to free themselves from the intra and peri muscular adhesions that are in the process of formation thereby preventing the usual disability frequently present in these cases. The auto-muscular or cellular massage has a favorable influence upon the edema by dispersing the effused lymph.

This procedure may be carried out by utilizing the faradic current with a mechanical surge so controlled that we may begin the treatment with very light stimulation and contractions increasing in strength as the case progresses.

Treatment may begin three or four days following the injury and be carried on without disturbing the splints by making application over the motor points higher up the limb. If bipolar contact is desired, this may be done by means of a water soaked electrode applied to the hand. In this way fibrosis and muscular atrophy are eliminated.

In the cases seen several weeks or months after the injury where firm fibrosis or ankylosis has taken place, the foregoing measures are supplemented with X ray and manual manipulation. These are the cases that demand an unlimited amount of patience and perseverance. Here massage and manipulation play a great part and the results obtained will depend upon the judicious administration of these measures.

A preliminary treatment of diathermy materially assists by inducing a relaxation of the parts. We believe the X ray to be the best solvent known for fibrosed tissues. Its action upon scar tissue is too well known to necessitate further discussion. It is employed in small doses, one third of an erythema dose, once a week.

In addition to massage and manipulation, the faradic surge is employed, as it affords a very convenient and efficient mechanical means of exercise and is of distinct value.

Summary

1. Diathermy is of value in bone and joint injuries and should be used early. It relieves muscle spasm, prevents edema and lessens pain.

2. By controlling edema and swelling further traumatizing of tissue and the resulting fibrosis is prevented.

3. Fibrosis of soft tissues may be prevented by early employment of electrical stimulation. If continued and increased in strength will prevent atrophy of the muscles.

4. In cases of long standing with fibrosis and ankylosis diathermy is of value, preliminary to massage and manipulation.

5. Small doses of X ray assist in the absorption of scar tissue.

6. Massage and manipulation consistently employed is of greatest value in cases of old standing.

The value of physiotherapeutic measures is not understood or appreciated by the vast majority of physicians, and for this reason is not regarded with favor.

However it has distinct value and is entitled to a place in medicine. Positive proof obtained by these measures merits a conscientious consideration from every physician interested in doing better work.

The Role of Physiotherapy in Low Back Conditions

By Frank B Granger M. D

Boston Mass

That the diagnosis and treatment of disabilities of the low back type is unsatisfactory, goes without saying. You have had excellent papers on their etiology and pathology, yet in many cases the diagnosis is difficult to make and consequently to institute the proper treatment is still more perplexing.

In traumas of the back the victim usually falls into the hands of one or more of the following classes:

1. The casual treatment of the casual physician where chloroform linament and a few strips of adhesive suffice whether the pathology be a crushed vertebrae, hypertrophic spine ligament or muscle injury.

2. The osteopath or chiropractor who in a few cases succeed but who in many others increase the disability and perhaps add their share to the existing trauma.

3. The orthopedist whose idea of support, rest and fixation are good and who links the X ray with careful physical examination but who in some cases is obsessed with the idea of rest and fixation to such a degree that atrophy and loss of muscle tone markedly retards recovery.

4. The physiotherapist who too frequently, knows little and cares less for proper fixation and rest and who attempts often with success to relieve muscle spasm to produce an active hyperemia with consequent tissue drainage but who also at times unduly stimulates structures needing for a short time rest and sedation.

It is evident therefore that success in treatment depends on first a careful and correct diagnosis second intimate teamwork between orthopedist and physiotherapist.

In all traumatic cases with which I suppose this meeting is chiefly concerned it is presupposed that there has been excluded postural defects with their consequent relaxation congenital anatomical defects, and all abdominal pathology, which might cause a somewhat similar clinical picture.

The traumatic cases which come to the Department of Physiotherapy at the Boston City Hospital exhibit muscle spasm as their predominant factor.

Relieve the spasm add what fixation is necessary if necessary for a short time institute what may be called general

tonic measures and as soon as possible employ proper voluntary muscle exercises not only to restore muscle tone but also to relieve the mental inhibition that exercise or work is impossible.

Many of the cases we see are found on X ray examination to have had an old hypertrophic spine which the trauma cause to flare up. Once in a while, we find the classical hitherto unrecognized vertebral crush. Rarely indeed, but still quite definitely we find a true sacroiliac.

Treatment

1 Hypertrophic spine aggravated by trauma. In these cases diathermy (internal baking) seems to give the quickest relief. This is due probably to the active hyperemia which it produces locally with consequent tissue drainage, and to the marked muscular relaxation it induces muscle spasm which is not of central origin.

Technic Place a metal electrode generally 2x10 inches over the lumbar region of the spine while anteriorly there is held on the abdomen by means of a sandbag or the hands of the patient a 10x12 inch metal electrode. Treat for at least 20 minutes with whatever current strength the patient can stand without discomfort. This will usually register on the meter from 800 to 1200 milliamperes. Of course if there is the slightest degree of pricking it means that good contact has not been secured and poor contact may mean a burn. If pricking does occur the area where it exists should be firmly pressed against the skin. If this does not remedy it, the electrode should be reapplied. At times when the pain is severe, galvanism with the positive pad posteriorly and the negative anteriorly for 25 to 30 minutes 15 to 40 milliamperes, will accentuate the effects of diathermy. In some cases, betimes, a low back brace insures a certain degree of physiological rest. If the process is fairly old and the exacerbation not too acute deep massage, vibration the static wave current or the slow sinusoidal will shorten the time of disability. At times, also the application of radiant heat will by dilating the cutaneous capillaries, deplete the enlarged deeper muscle and relieve pain and stiffness. By some of the above methods the classical six months minimum may be materially lessened. Here again it is assumed that all possible foci of infection have been eliminated such as teeth tonsils sinuses gall bladder prostate or pelvic infection, etc.

2 Sprain of the lumbosacral or lower lumbar joints. These are the so-called "lifting strains" where the patient feels that something gives way and perhaps hears a snap. These are

generally ligamentous or muscle tears. The ligamentous ones are characterized by soreness and tenderness which are deeper situated. Here again muscle spasm stares us in the face. Pain is elicited by lumbar movement. The erector spinae muscles, deep spinal ligaments or the ligaments which are inserted about the sacrum or sacro-iliac joint, are chiefly involved. The muscle spasm is naturally a reflex one due in part to nerve pressure which pressure is caused by the resultant edema or possibly hemorrhage into the soft tissues. Physiological rest, an adequate back support and immediate physiotherapeutic measures should and do lessen the duration of disability. Again diathermy with larger electrodes than hypertrophic arthritis but with the posterior one appreciably smaller than the anterior followed by the sinusoidal or the static wave current, has given us the best results.

3 *Sacro-iliac strain often associated with sciatica.* Here manipulation followed by short adequate strapping, diathermy or baking sinusoidal or static wave current and deep massage or vibration should achieve quick results.

4 *Myositis.* Though this diagnosis has been overworked at times yet inflammatory processes do occur in muscles and true myositis is quickly relieved by radiant heat, deep vibration, massage and static sparks. At times diathermy or the slower heating process of galvanism with a positive pad over the contracted muscle will also achieve the same result.

5 In spinal infections such as tuberculosis or osteomyelitis, in addition to appropriate orthopedic and surgical measures, ultra violet light therapy given both locally and generally at least deserves a trial.

6 *Perostitis.* A few cases have shown under X-ray examination a definite perostitis which has persisted and which has caused severe pain. Either because of or in spite of diathermy, a fair percentage of such cases have promptly recovered.

7 *Malingers.* We get them at times. It is hard to say a man hasn't a pain in his back just because we can find no objective evidence. In most of these cases the greenback has all other therapeutic measures beaten by a large margin.

(From *The Industrial Doctor*)

The Treatment of Bell's Palsy by Physiotherapy

By J C Elsom, M. D

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(*Abst from Clin. Med. Oct 1925*)

Bell's palsy is easily recognized. The face on the affected side is immobile and its wrinkles become smoothed out. The lower lid droops and, because the punctum lacrimale is not in contact with the conjunctiva, tears trickle over the cheek instead of passing into the lacrimal duct. The eye is more widely open on the affected side, and cannot be voluntarily closed on making the attempt, the eye ball rolls upward. The patient cannot purse his lips, nor whistle. When he laughs, or attempts to show his teeth, the mouth is drawn strongly over to the unaffected side.

The prognosis, as in the case of other nerve disorders, is largely based upon electrical reactions. If reaction is normal, or nearly so, the prognosis for a fairly early recovery is good. If the reaction of degeneration is only partial, recovery may be expected within perhaps three months. Complete reaction of degeneration gives a doubtful prognosis. Recovery may take six months or a year.

Treatment

The treatment of Bell's palsy by physiotherapeutic methods alone seems productive of very satisfactory results. In most cases, the patient is considerably alarmed concerning his condition and is apprehensive as to the outcome. He is often fearful of some mysterious and destructive brain lesion. Therefore at the outset, the patient should be encouraged and his fears allayed by giving a hopeful prognosis. As far as possible, the patient may engage in his usual occupation, avoiding mental and physical strain and worry. The usual advice as to hygiene may be given, stressing the importance of sufficient sleep, moderate exercise, and attention to diet and elimination. Possible foci of infection should in all cases be discovered and removed if possible.

Heat to the affected parts of the face, ear and mastoid region should be employed. Its effect seems very beneficial. The heat may be employed in several ways. Hot water bags, used at home, are helpful. The radiant heat and light from the modern "deep therapy" lamps is our own routine treatment. The action of the smaller lamps is very efficient. If

teen or twenty minutes of this radiant heat is followed by dia thermic, with the following technic two metal electrodes are connected to the D Arsonval terminals of any good, resonant high frequency machine. In our own work we seat the patient near a table, with his elbows resting comfortably. He holds in his hands two hand electrodes one placed over the affected part of the face near the angle of the jaw the other on a similar part of the unaffected side. The current is turned on slowly and a few minutes used in gradually advancing the milliamperage up to about 500. The sensation is one of a pleasant, sedative heat. The treatment should last from twenty minutes to a half hour. It is better, occasionally to shift the position of the electrode on the affected side and, for a part of the treatment, apply it near the mastoid region. The next step in the treatment is the application of the galvanic slow sinusoidal current.

The older textbooks recommend mostly an expectant form of treatment with absolute rest. Our own experience has been that the sooner the treatment is begun the better the results. Consequently we begin the heat and electric treatment at once. The galvanic slow sinusoidal current is given using two equal sized electrodes (about an inch and a half in diameter) one of these placed in front of the ear sometimes on the mastoid region the other moved about along the motor points of the affected muscles. These points are best located near the angle of the mouth the lower and outer border of the nose and the side of the chin. A mild current is given especially in recent cases and continued for only a minute or two just enough to produce a mild muscle contraction. Later the stimulation may be increased and the time of treatment lengthened to five or ten minutes.

In addition we make use of exercise and massage. The patient is encouraged to make an effort to use the affected muscles and to do any voluntary muscular effort of which he is capable. Blowing up the cheeks and trying to prevent the escape of air from the affected side of the mouth is a good form of exercise.

When improvement begins to take place one of the first signs is the extension of wrinkles on the forehead when the patient raises his eyebrows by muscular effort. The mouth next shows improvement in most cases the ability to close the eye completely comes last. If during sleep the eye is imperfectly closed our own practice in some cases is to use a small strip of adhesive plaster applied from the cheek to the forehead pulling the eyelids together thus preventing an undue sagging and stretching of the unused facial muscles.

The last form of the treatment is the application of massage. This is given after the muscles and tissues are well heated the movements are made with the finger tips, gently kneading and stroking the affected muscles. All of the forms of treatment enumerated are best given daily or, at least three times a week.

Case Reports

Case No 1 H E W, white, male, aged 26 previously in good health well nourished occupation farmer First seen at the Jackson Clinic, June 27, 1925 Family history, negative. Went in swimming June 25th and afterward drove his car ten or twelve miles, a cool wind blowing on his wet hair. The next morning noticed complete facial paralysis on the right side. Applied for diagnosis and treatment the next day Treatment as indicated above given twice a week and heat applied several times daily at his own home Five diathermy treatments given at the Clinic. Reported July 18th entirely relieved with full muscular movement. The right lower lip was slightly atrophied at the corner from disuse

Case No 2 Mr L traveling salesman, drove his car a great deal often taking long drives One morning, after a long drive he tried to whistle as he was dressing and found he was unable to do so Complete facial paralysis for which he received no treatment until ten days had elapsed. Developed a multiple neuritis shoulders arms and hands being affected. Facial paralysis cleared in two months after three treatments weekly General diathermy benefited his neuritis and general ultra violet radiation was continued for a month longer with success

Twelve similar cases have been treated during the past six months all attended by good results

Conclusions

Treatment for Bell's palsy should be instituted immediately at the onset.

Prognosis depends on the normal response to galvanic stimulation Diminished contraction of the facial muscles may be expected to some extent if there is no response to galvanism the case is severe and will probably take many months before recovery

The application of radiant heat and light (convective) and diathermy (conversive) is indicated

Galvanic stimulation of the muscles should be done carefully and for periods of short duration with gradually increasing seances

Massage and active exercise are helpful
(Reprinted from *Fischer's Magazine*)

Diathermy to the Heart

By Gustav Kolischer M. D

Chicago Ill.

(From *Jour Radiol*)

The heart is the most important organ in the regulation of the blood supply. Shooting pains, fainting spells and all these symptoms are due to an insufficient blood supply of the heart. The nerve centers that regulate the heart action are located between the ventricles and the auricles. If on account of the calcification of the coronary arteries the blood supply of the nerve centers located between the ventricles and the auricles becomes lower than an attack will occur because the nerve centers are reduced in blood supply.

If heat produced by a high frequency current is applied the femoral arteries become dilated and the patient will get over the attack. This dilatation will persist for quite a while after the treatment but after a while the treatment must be repeated. While it is not a cure—we cannot change the arteries—we relieve the patient for a long time of all these dangerous symptoms. The arteries of the heart are dilated so it is important not to overdo this treatment. We follow these rules. In the first place any time that either the abdominal or pectoral cavity is treated the diameter of the electrodes should correspond with the depth of the chest or belly. The sphere put on the chest and back should have the same diameter as the chest from the front to the back. Place the electrodes over the heart and begin slowly with the current and never raise it beyond 100 ma. One gets all the good results with no excessive amount of the current. The proof of this is that after the treatment is over the patient will say he feels fine. If it is overdone the heart is over stimulated and the patient will become restless and produce a cold perspiration.

These treatments should not be given oftener than twice a week. Test your patient in each case. If you have to deal with a nervous individual go slowly with a robust individual you can go faster. The main thing is not to do too much. It is remarkable what can be accomplished in these cases.

(Reprint d from *Fischer's Magazine*)

What Physiotherapy May Do to Aid Orthopedic Surgery

By F. H. EWERTHARDT

The subject matter contained in this paper, "What Physiotherapy May Do to Aid Orthopedic Surgery," is based on experience obtained at the Physiotherapy Department of the Washington University School of Medicine, St. Louis. It operates in very intimate correlation with the Orthopedic department which sends us patients with a definite diagnosis and request for treatment. This is also true of private patients who are sent to us by surgeons not connected with our hospital. This department was opened ten years ago and thus far some seventy thousand (70,000) treatments have been given. I wish to make it clear at the onset that when I speak of physiotherapy I do not mean electric therapy exclusively as seems to be the vogue these days. In our department we employ in addition to the electric current water, light massage and exercise and we are firmly convinced that many times we obtain results with one when another seems an utter failure.

The types of cases which most frequently come to us from the Orthopedic surgeons are as follows: fractures, dislocations, and sprains; muscle, tendon and peripheral nerve injuries; arthritis of all degrees; the so-called painful shoulder including sub-deltoid and sub-acromial bursitis; peri-arthritis; injured deltoid, supra spinatus and biceps muscles; calcareous deposits etc.; flaccid and spastic paralysis; flat and club feet; curvature deformities of the spine including scolioses, kyphosis, lordosis and the very common functional faulty posture.

It is obviously impossible to go into detail regarding the treatment of each of these named conditions for which reason we will aim to discuss them in groups and present a general outline of rational physiotherapeutic treatments supplementary to that given by the orthopedic surgeon himself.

Our equipment consists of several high frequency machines, vibrators, the Morse wave generator, mercury vapor and carbon lamps, high powered incandescent lamps and infra red apparatus. In the hydriatic section we employ the commonly known needle fan shower scotch douche unit and the electric

light cabinet an effervescent bath outfit and the whirlpool bath. We have a medical gymnasium which includes in its equipment besides the usual apparatus a number of special mechanical devices for use in the treatment of muscle, nerve and joint defects. With this variety of modalities at our command we are able to change our treatments as conditions may require. It would be exceedingly difficult to say which particular section is of the most value to us for we find that in many cases one is a complement to the other.

In the treatment of fractures we feel that each individual case is an entity in itself and should be treated as such but in general we have definite symptoms which we aim to meet by means of one or another modality. This may be perhaps best illustrated by using the treatment of Colles fracture as an example. We prefer to have this fracture immediately and very frequently it is brought to us within twenty four hours. Our first aim is to remove pain swelling and spasm and we employ for this purpose heat and massage. Heat may be given in the form of diathermy or the deep radiant light which in turn is followed by light stroking effleurage and deep drainage massage above the seat of fracture. This is followed by maximum passive flexion extension and circumduction of the fingers which of necessity must be passive, for usually the patient will not himself flex or extend the fingers to their maximum degree. As soon as union is firmly established we place the patient on selective exercise. We choose for this purpose an ordinary one pound Indian club and teach the patient simple movements which graduate progressively into more intricate ones. We find that by means of this procedure we can get the patient to exercise actively the intrinsic muscles of the fingers as well as the larger groups of the forearm. This procedure excites interest on the part of the patient to learn the particular movements involved and he becomes less conscious of his injuries and therefore more co-operative. We are quite convinced that by this method we have succeeded in very definitely decreasing the period of convalescence. It must of course be assumed that the Indian club exercises just mentioned are only given after a sufficient period has elapsed to cause union and avoid displacement which may be anywhere from ten to twenty days in case of a Colles fracture. In cases where we are reluctant to employ active exercise as described we use the sinusoidal current. This scheme of

treatment is a general outline which we follow in all kinds of fractures modifying the treatment according to the type of fracture where located and the degree of displacement.

In a recent convention held in this city I heard a prominent electro therapist remark in the course of a discussion on the treatment of sprains that frequently with the aid of the static current he is able to dismiss his patient the second day. He stressed at some length the qualities of the static machine. I have treated many sprains and dislocations during my time but must admit that I am not in the class of the surgeon just alluded to. I feel that the publication of such reports either by mouth or letter will do the cause of physical therapeutics grave harm and I strongly recommend to those engaged in this work to refrain from exercising an over abundance of enthusiasm when reporting cases. Referring again to sprains it is a good illustration of a condition which the surgeon of the old school is unable to handle properly. The old idea of a figure-eight bandage or possibly a plaster bandage and rest has been superseded by the modern and classical physical therapeutic treatment with which we are all familiar. I have obtained splendid results by using the whirl pool or contrast foot baths deep radiant heat diathermy and massage. I also apply lateral adhesive straps to reinforce the lateral ligaments of the ankle raise the outer edge of the heel and sole and urge my patients to perform active movements. The static current has been found by others to be an excellent modality in these types of cases.

Arthritis in its various phases is treated in our department by every possible method in our possession. As we all well know arthritis is one of the most intractable conditions with which we come in contact. In general we apply heat by means of diathermy radiant light and the whirl pool baths, followed by massage active and passive movements, galvanism and ionization. To strengthen the atrophied muscles which are almost always present we also employ the sinusoidal current. To stimulate his resistive power we give to our patients our pet tonic treatment of five to ten minutes in the electric lighted cabinet followed by the needle bath and scotch douche. In some cases this is followed by ultra violet radiation.

An interesting condition which frequently is referred to us is the so-called painful shoulder. We include in this definition

the various injuries and inflammations to which this joint is susceptible. The treatment to some extent is identical. The desideratum first of all the relief of pain and the restoration of function for so long as these symptoms are present the removal of spasm is impossible. For the first we employ diathermy radiant heat and positive galvanism. If adhesions are present the arm is either manipulated manually or we may use the surging sinusoidal wave and massage. This may or may not terminate the treatment for the day. If possible we next direct our attention to the spasm atrophy and faulty co-ordination for the correction of which we resort to exercises. We use exercises of various types active passive and resistive. The patient is generally reluctant to voluntarily abduct his arm and if an effort be made to raise it passively he brings about a defensive muscular contraction either consciously or unconsciously which prohibits or at least markedly interferes with the attempted movement. This true passive movement can be successfully carried out only when extreme caution is used by the operator and when he is working in absolute harmony with the patient. The neuro-muscular system is a very intricate piece of apparatus and responds quite definitely in accordance with recognized physiological laws. In order to amplify this thought I will briefly quote from a previous communication on the subject. Let us assume that we are dealing with a traumatic knee which has reached a stage of repair when the surgeon desires that it should be flexed. He orders passive motion without having the slightest thought that true passive motion in a traumatic knee is practically impossible because of the resistance offered by the patient who resists in the belief that the movement will cause pain. He may even make a very definite and conscious effort to counteract this tendency but the examination will nevertheless show the quadriceps to be in strong contraction. The result is a very painful manipulation of the joint with only a limited degree of motion. It is at this point that we may well recall to our minds the interesting fact reported by the English physiologist Sherrington and others that voluntary muscles are for the most part formed in opposing groups and that the same mechanism which causes contraction of one also causes inhibition and relaxation of the other. Utilizing this principle in our injured knee case we need but apply a slight resistance to the heel of the supported injured leg and ask the

patient to flex the knee. If the patient is certain that the operator will not attempt passive motion, but that he will merely support and resist the leg and if he is told to bend his knee as far as he wishes encouraging him to do so to a maximum degree, we will find that the knee flexor will be actively engaged, and that inhibition stimuli are being sent through the proper nerve apparatus to the extensor group causing relaxation of the spastic quadriceps extensor and resulting in a decided increased motion of the knee as compared to that obtained by purely passive motion.' We have therefore consistently used resistive movement when dealing with joint injuries.

Flat feet is a very common condition both in the growing child and in the adult. If not of a traumatic or arthritic nature we may well assume that the etiology in the main is a weakening of the muscular group which normally supports the arch. It is obvious therefore that the treatment shall be directed to strengthening this weakness. We employ for this purpose methods which will stimulate the vaso-motor system and to my mind the contrast or the whirl pool bath stands out pre-eminently over and above all other methods. The second point is to strengthen these weakened muscles by the use of the sinusoidal current, or what I much prefer, active exercise on the part of the patient. These should be movements in the direction of adduction inversion with flexion of the toes and avoiding as much as possible abduction.

The so-called sacro iliac and other allied painful symptoms of the lower back are frequently sent to us by the orthopedic surgeon. These cases are free of any organic pelvic condition and are purely orthopedic cases. The pain may be the result of a number of causes and each must be handled in accordance with the findings. After removing the cause and applying proper corsets, shoes and perhaps belts, the patient still has pain and discomforts and the surgeon comes to the physiotherapist for assistance. The patient pleads to be relieved of his pain and of the frequently recurring condition. We treat the symptoms as noted with the various heat giving modalities and in certain selective cases we add certain movements. It is our theory that in these cases the intense spasticity of the lower back muscles are a factor in the frequently recurring symptoms and to a large extent responsible for the uncomfortable state of mind with which these patients are

obsessed. They constantly fear that the slightest movement will bring about a recurrence of their painful condition which fact produces subconsciously a spastic muscular contraction of the lower back muscles. It is a defensive act to immobilize the lower spine. This in turn brings about an error in the proper co-ordination of these muscles with the result that any inconsequent movement like for instance stooping forward to tie the shoe string may bring about a recurrence of the painful condition. To remedy this we employ a type of rhythmic movements which we have found extremely beneficial. These are not developmental exercises but movements intended to restore co-ordination.

You will have noticed from the foregoing that I am an advocate of physical exercise as a mode of physical therapy. If judiciously and scientifically applied it can be made to play a very important factor in the treatment of many medical and surgical cases. As you well know however few doctors are qualified to prescribe it which is equally true of electrotherapy. Improperly prescribed and applied exercises may be injurious not only to the patient but reflects badly on the medical profession as well. I have known of many patients with faulty posture and curvatures of the spine who have suffered because of these facts. In several cases abdominal exercises were prescribed for the correction of lordosis which was caused by a weakening of the lower spinal muscles and not as the doctor thought by the abdominal group. He wondered why the condition did not improve. We all know of cases of poliomyelitis which have been immeasurably and irreparably damaged by indiscreet and ill advised exercises. Those types of cases come distinctly within the scope of physical therapy. It is not our function however at this time to go into details concerning this phase of treatment in curvatures and paralysis. Each in itself forms a topic for a complete paper. Briefly however we may state that in flaccid paralysis we employ heat in its various forms for the purpose of improving the general nutrition of the muscles and as a preparation for massage and exercise which follows. We also use the galvanic, the faradic and the sinusoidal currents for the purpose of improving nerve and muscle tissue. All these procedures however do nothing toward re-establishing voluntary motion. This can only be brought about by one agency and only one namely voluntary purposeful active exercise. Ex-

ceedingly great care must be used to determine the degree of properly selected exercises

I have emphasized somewhat the use of exercise as a remedial agent because I believe it to be of great value and should receive more space on our programs. This should not be construed to mean that I undervalue the other modalities. I do not. I believe the introduction of diathermy to be a most important landmark in the field of therapeutics. The same may be said of the ultra violet ray. Physical therapy has proved its value and has imbedded itself in the consciousness of the medical profession. There are however, several forces opposing its more general acceptance. One is the almost unbounded claims made by some of its adherents. Another is the practice of the various physical modalities by nonmedical persons who are also otherwise not properly qualified.

Renal Disease

By Curran Pope, M. D

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It is an interesting psychological fact that the medical practitioner when confronted with a case of kidney disease has a mental picture of a destructive lesion, that involves the entire kidney structure that the prognosis, because it is kidney disease is *per se* serious and dangerous and perhaps fatal. Nothing could be further from the truth.

To me one of the most illuminating and outstanding factors bearing on this question was a cat. This animal the subject of kidney removal and partial destruction, belonged to Dr Martin Fischer of Cincinnati. In spite of the loss of much kidney tissue I was informed that this female had been delivered of a number of litters of kittens, had survived and did not pass into coma and die. Of the ultimate outcome in her case defendant cannot further state. But the interesting lesson to be drawn from this feline is that Nature has given us an over supply of kidney structure and that given a nephritis it does not follow *ex necessitate rei* that all the kidney structure is involved or in process of destruction.

A proper mental attitude on the part of the physician is of inestimable advantage to the patient suffering from nephritis, for it leads the practitioner to active interference not alone to check the pathology present and save uninvolved tissue but to make strenuous efforts to bring about a *restitutio ad integrum* of the tissue involved. I have seen good men greatly depressed by such a diagnosis in their *clientele* because Bright's disease is a fatal and dangerous ailment. Nor must one focus his attention on the kidney alone for a general view taken of the patient as a whole will oftentimes change our outlook in such cases. It is indeed faulty medicine not to examine thoroughly. We can again quote that oft quoted remark of Osler's that it is just as important to know the patient the disease has as to know the disease the patient has and this can only be determined by a general and somewhat extended acquaintance with the patient's physical functional neurological and psychic state.



Fig. 1. Showing application of abdominal and dorsal electrodes in diathermic treatment of Renal Disease.

The fear of renal mischief is not limited to the medical man, but it terrorizes the patient and fear is a great waster of reserve force.

It is to be regretted that in this class of cases so few measures are employed to relieve the trouble. There is a tendency in the subacute and subchronic cases to put a patient to bed, strictly at rest upon a diet, and carefully limit and restrict the intake of food, especially protein. This can be easily overdone. In those who habitually overeat, and eat highly seasoned

and overstimulating food the change to plain, simple well cooked food lessened in quantity, may be all that is necessary to check the progress of the disease. If a strict diet is essential it has always been my principle to just as rapidly as possible get the sufferer back upon the maximum tolerable diet of proper food stuffs. In this day and generation total abstinence is the safest for all but the irritative products present in the "stuff" now called whiskey, absolutely preclude its use, under any and all circumstances. Again it must be borne in mind that it is not necessary to "wash the kidneys out" by free water drinking. The influence of water upon the economy and upon a kidney struggling with its own disease, becomes a problem that a physician only can and must try. The modern tests of the kidney by water ingestion will give much useful information that can be practically applied to a given case. Rest is essential but this does not of necessity mean in bed. It can oftentimes be better accomplished by late rising early retiring and lessened exertion in the interim. There are many patients who do not readily tolerate too much restriction of physical activity and unless the emergency is pressing judgment must be used. Rest should not be limited to the body alone but wherever possible a wholesome mental rest must be secured. This may be obtained in active and busy men and women by changing the kind of mental activity. An interesting magazine a good novel, a tale of mystery or of the great outdoors gives a psychic outlet that is much better than sitting or lying in bed thinking worrying or twiddling one's thumbs. Gentle exercise combined with a

maximum of fresh air can be obtained from sensible motoring for a short time followed by a complete rest in bed or on a lounge for an hour or two.

Medication requires judgment and must be used to suit each case. My personal predilection is for as little medication as possible. I have seen alkalinization help also the use of some of the glandular products especially nephritin. Watching the renal elimination keeping a close eye on the cardiac apparatus and skin, will enable one to meet the needed requirements of chemical treatment. Any underlying infection such as syphilis must be noted and treatment instituted but not in my opinion by the *salvarsans*. Careful tentative use of hydragyrum and bismuth is better than arsenic. All focal infection must be removed and promptly treated, and it is not an unusual thing to see prompt betterment after a focus has been cleared. But I here protest again against the useless, wasteful and often needless sacrifices upon the altar of fetishism by the reckless removal of teeth and tonsils. Some should be removed that is true. But remember that store teeth are poor substitutes for the ones grown by natural processes and that the removal of teeth may be the beginning of gastrointestinal disorders that may in themselves produce such a disturbance as will not only aggravate but terminate a kidney case.

Renal cases as a rule are benefited by colon drainage or lavage, and by this I do not mean enemas high or low, but real cleansing of the colon by many gallons of water followed by proper treatment or by the implantation of 'friendly' bacteria. It is astonishing how some cases clear up under this form of treatment. Like everything else in medicine it requires care and judgment in its use and an



FIG. 2. Acute Low T-treatment in Renal Disease.

adaptation to the particular case in hand. That the colon is a cloaca from which come many poisons cannot be denied, and that it is the cause or basic factor in many others will be readily admitted by those who are really familiar with the subject.

It is really astonishing how few men employ other measures than those heretofore enumerated and yet in the domain of physical therapy there are many modalities that aid, not alone in restoring the diseased kidney, but in relieving underlying and contributing factors of a case. At the head of these modalities I place hydrotherapy and static electricity. The use of baths, except in sanatoria and at springs, is rarely employed. In the acute subacute and chronic cases they have a powerful effect. In bedridden cases, use the fomentation (130-140 F) should be applied over the kidney for twenty minutes every three hours. Diaphoreses may be obtained by the electric light bath prior to the use of the fomentation and followed by a blanket pack for one hour. There is an intimate reciprocal action between skin and kidney and though diaphoresis stimulates the compensatory activity of the skin it is not for its eliminant action alone that it is used for its eliminant power is limited. It also stimulates other organs to act.

Another method is the full hot bath at 100-110 F for twenty to forty minutes. This is especially valuable procedure with children when followed by the full dry pack for three quarters of an hour. To both of these measures should be added gentle friction of the skin, to maintain the skin circulation.

In ambulant cases the hot air, incandescent electric light or superheated dry hot air baths are valuable. The electric light bath is the most valuable. These methods divert the blood in the internal organs to the skin like a great suction pump relieving intra abdomino-renal pressure and congestion, thus enabling these organs to function better. Care must be exercised to prevent chilling. Cerebral complications are best met by cold cephalic compress or ice cap. In chronic cases a preliminary heating to moderate perspiration by the incandescent electric light bath followed by the full wet pack at 90 F for 20 minutes decreasing temperature 5 F daily to 70 F and increasing the time to one hour. Or, the light bath may be followed by the dripping sheet rain shower spray or douche bath graduating the temperature, pressure and duration to suit the case. The

Nauheim or CO₂ bath is very valuable in these cases helping both kidney and heart.

I have seen the *Static* clear up a kidney when everything else had failed. Commencing with light and short treatments it should be rapidly increased to as strong as can be borne, finally using heavy indirect sparks to the entire spine over the kidney region and liver, followed by the *Wave Current* using a condenser and applying the electrode over the kidney region. I have on a number of occasions examined the urine following these applications and found at the start an increase of casts and renal cells rarely an increase in albumen to be followed later by a cleaning urine and clinical betterment of the case.

Diathermy is a valuable method in these cases. In the acute case in bed we should use smaller amperage and shorter duration of treatment and if necessary give the treatment twice daily. In the convalescent or ambulant patient heavy doses are indicated. I prefer a dosage of 1000-1500 milliamperes for 10-15 to 20 minutes rather than a much longer time at a lower milliamperage.

Aetinic Light the air cooled lamp may be used for its general vitalizing and fixing purposes. In fact every method that increases the general health is of value insofar as the local inflammation is concerned. It should be applied to the entire body surface, anterior and posterior.

Sinusoidalization by means of the Morse Wave Generator is most valuable in overcoming the constipation and intestinal stasis present. These are cases in which it is desirable to avoid if possible the use of cathartics and laxatives. Diet exercises of the abdomen and the sine wave are the preferred measures. Place one electrode on the lower abdomen and the other cross-wise of the spine just under the shoulder blades (7 to 10 dorsal) using cam 4 scale 6 (or 60) if possible for 10 to 20 minutes. The abdominal contractions must be gradual firm, full and the relaxation slow a rising holding and declining contraction. This develops muscular tonicity and increases intra abdominal pressure and activity.

In conclusion the reader's attention may be called to the fact that any and all of these measures may be employed alone or in combination without there being the slightest contraindication for their use. The careful scientific and intelligent combination of rest diet hygiene chemical and physical measures will often bring results when ordinary drug and other medication fails.

Sciatica

By Miles J. Breuer, M. D.

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The term Sciatica, covers a multitude of clinical conditions differing in etiology, pathology, and treatment it has a different meaning to every person that hears it. In discussing the applications of physiotherapy to this disease, the main part of the discussion must be taken up with diagnostic considerations for a given technic may be very beneficial to one patient and fail utterly on another who apparently has exactly the same condition. The physiotherapist who considers technic only will find himself blundering wildly and failing to get results most of the time and will probably come to the conclusion that physiotherapy is not much good after all.

The reader is therefore advised to review the subject, after reading this sketch, in some standard text book on neurology, such as Church and Peterson, or Jeliffe and White. If he does, he will find that these writers definitely recommend physiotherapeutic methods in their sections on the treatment of this condition.

We may first broadly divide sciatica into two portions sciatic neuralgia and sciatic neuritis. Theoretically there is no difference except in degree but in cases termed neuralgia, the inflammation of nerve structures is so slight that pain is the only symptom. In the neuritis conditions, there will also be other physical findings of impaired nerve function. I will list them in the order of severity the more severe the inflammation the further down the list will the findings occur.

Pressure points of extreme tenderness, usually as follows the sacro-iliac joint the sciatic notch and the head of the peroneus muscle.

Hyperesthesia of skin areas over the outer and posterior aspects of the leg and thigh.

Motor deficiency in muscles supplied by the sciatic nerve which are the extensors of the leg and foot the patient is unable to rise on his toes drags his feet as he walks and has diminished or absent reflexes including the patellar plantar and Achilles.

It would seem unnecessary to state that sciatica must be differentiated from sacro-iliac arthritis and from disease of the hip joint were it not for the fact that the error is made fre-

quently enough Putting the sciatic nerve on a stretch by flexing the thigh and extending the leg will always produce pain in a sciatica in hip joint disease any movement of the hip joint (meaning an actual change in relative positions of femur and pelvis) will produce pain Sacro-iliac arthritis may co-exist as the primary condition with a sciatica

Let us first consider the functional sciaticas in which it is absolutely useless to tinker locally with the sciatic nerve Anemic conditions are a frequent etiology in such cases treating the original cause eventually relieves the sciatic pain Look for pernicious anemia nephritis endocrine disorders malaria syphilis, and intestinal parasites Diathermy sometimes gives temporary relief use a tin electrode over the sciatic notch and a cuff around the leg Negative galvanism by the same method may also serve palliatively

This temporary palliation is not even possible in another class of sciaticas the reflex group This is sometimes a very puzzling condition and very frequently it defies all of our efforts at relief as well as at finding a cause Diseases of the heart lung stomach liver kidney ureter bladder intestine uterus ovaries prostate or testicles may produce reflex pain in the sciatic nerve The reader who is familiar with the mechanism of the production of Head's zones will understand this point if he will in addition consider that these zones may overlap to a great extent by means of intercalated neurones Even in these cases it is worth while trying for palliative results with diathermy high frequency sparks or galvanism and even actinic light reactions upon the principle of counter irritation In considering this particular group always think of chronic constipation, which is a very frequent cause of sciatica

Finally as our last functional group we have the sciaticas brought on by psychic and emotional causes Many of these respond quite readily to physiotherapeutic methods as might naturally be expected These are the cases that leave their crutches at the shrines of all kinds of bunk healers Yet, they are a very real problem in the hands of the physician a problem to diagnose and a problem to treat

Now for conditions in which there is anatomical inflammation in the nerve Arteriosclerosis is one of our frequent causes the interference of blood supply to a nerve has very painful results, and is produced either by restriction of blood volume coming from larger vessels to the nerve or by actual endarteritis of the endoneurial artery The relaxing effect of diathermy with its augmented mobilization of blood is always beneficial in this condition

Probably the vast majority of cases of sciatica are due to

the direct action of toxins on the nerve tissue. We have the following groups of toxins metals, as lead, arsenic, mercury and copper organic poisons, alcohol, tobacco, carbon monoxide infections, as tonsillitis, typhoid fever, measles, gonorrhea, influenza, syphilis, and streptococcus also fatigue and exposure to cold. Here, again, is an excellent opportunity to do a great deal of good by physiotherapeutic methods. Diatherapy, with its increased blood supply, bringing reinforcements of leucocytes, opsonins, and other substances for biological defense, and increased nutrition, is the choice of all methods of treatment physiotherapeutic or otherwise the only thing at all of equal importance with it, is the eradication of the source of the toxin and the elimination of what toxin remains in the body. A block tin plate over the sciatic notch, and a half cuff around the leg below the lowest point of the pain is the technic and as heavy a current should be given as the skin will stand. Take good care of the skin if that is burned the treatment is interrupted, for the area of application is limited. During the acute stages, the limb should be kept as nearly immobilized as is practically feasible. Negative galvanism is the second choice for treatment, but is very effective. A battery must be used a mechanical source because of the unsteadiness of the current is so painful and irritating that currents of sufficient strength to do any good can not be used. Hydrotherapy, especially with hot packs, is also of limited application. In sciatic inflammations due to infection salicylates should be used the intravenous route being preferable as not interfering with appetite and digestion. Iodides intravenously, should be used in all inflammatory cases.

In chronic cases a great deal of patience is necessary nerve tissue recovers very slowly. In case of severe nerve inflammation where the nerve is destroyed, the nerve must regenerate from the nerve-cell body in the anterior horn, which requires from three to nine months. If reactions of degeneration appear indicating that this has taken place, it is necessary to keep up the nutrition of the muscles in the interim by stimulating at the motor points with galvanic make and-break shocks for this a mechanical current source is excellently adapted.

(Reprinted from *Lischer's Magazine*)

Diathermy in Gynecology

By W. B. Chapman, M. D.
Chapman Clinic, Carthage Mo.

Diathermy or internal heat when used in the treatment of inflammatory diseases of the female pelvis has the following general effects:

- 1 It alleviates pain.
- 2 It has a localized action.
- 3 It increases the blood supply to the part.
- 4 It leaves no bad after effects.

5 Bacteria are either killed or attenuated in virulence according to their ability to resist high temperatures. The gonococcus is attenuated in virulence and prevented from reproduction by a temperature of approximately 104 degrees Fahrenheit.

Charting High Frequency Apparatus

In giving vaginal treatments with the high frequency Diathermy apparatus, either the high or low voltage coil may be used, the relation of which is given in Chart No. 1.

In High Frequency apparatus, as in X ray machines there is a wide degree of variation in the amount of current delivered to the patient and each machine should be charted.

It has been the custom in the past to place the electrodes where deemed necessary and raise the amperage to the patient's tolerance, and as a result the whole proceeding was of a haphazard nature with sometimes beneficial but quite often unsatisfactory results. The machine or the treatment was condemned when really the operator's technique was at fault.

What was needed most of all was a means of knowing the exact temperature produced within the tissues by the electric current. This means was provided when not long ago a thermometer attachment was perfected for use with the vaginal electrode.



Fig. 1. Vaginal Electrode with Thermometer

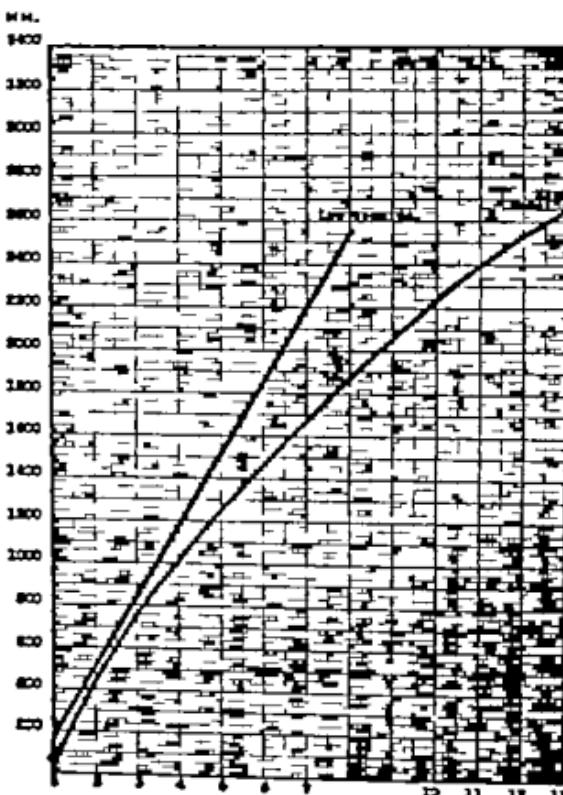


FIG. 2. Chart showing amperage under both low and high tension control.

proximately 135 lbs. The vaginal electrode was inserted and the patient arranged for treatment in the usual manner. The indicator of the auto-control was set at one and then gradually stepped up to the patient's heat tolerance, the amperage readings being recorded with each step. The spark gap was regulated to insure a steady not intermittent, flow of current and the results graphed.

Amperage chart No. 2 gives the mean of these tests. I repeated these tests on all treatments upon women varying in weight from 120 to 140 pounds and the results were approximately the same in each instance, a few pounds difference in weight making no appreciable difference in results.

Such a chart is of considerable value, as it gives the operator a check on what the machine is delivering to the patient. This chart also shows the relation of the heating effects obtained by both the high and low tension coils. By referring to this chart it is seen that the same amperage is obtained by setting the auto-control on point eight with the low tension coil as is obtained by No. 12 using the higher voltage. This is also of practical value, as the higher voltage occasionally produces

Since using this attachment in connection with the improved Chapman Vaginal Electrode Fig. 1, I find that it is quite possible to pass a considerable amount of current through the patient with very little heating effect, and as the efficiency of the High Frequency treatment is dependent entirely on the degree of temperature produced within the tissues, the value of the thermometer attachment cannot be overestimated.

In charting my machine, tests were made on a woman of medium stature and weighing ap-

cramps in the patient's legs when set too high whereas this is not the case using the lower electromotive force, and still the same amount of heat is produced.

As already mentioned care must be exercised to always have a steady flow of current across the spark-gap. The amperage may be varied from 50 to 150 milliamperes by adjusting the gap and a spluttering spark-gap is to be avoided. It not only produces unsatisfactory therapeutic effects, but may cause Faradic contractions with discomfort or even danger to the patient.

Effect of Resistance on Amperage

The effect of resistance on the amperage obtained is another point to consider. While this is not marked in the ordinary type of treatment nevertheless the amount of tissue to be traversed by the current must be taken into consideration and the settings adjusted to suit. This is a point that can be determined only by the experience of the operator. There is also a considerable variation in the resistance of the individual to the passage of the current. This resistance lies largely in the skin. Experiments carried out along this line demonstrate this fact. It has been found however that salt water, or soap lather to which a certain amount of sodium chloride has been added reduces this resistance approximately fifty per cent, and we now coat the electrodes and skin with a paste made of Ivory soap flakes to which a small amount of sodium chloride has been added or else use the special Soap Paste prepared for this purpose. This paste is put up in collapsible tubes and is very handy to apply. It contains the necessary ingredients in their proper percentage.

Chart No. 3 shows the great difference obtained in using the abdominal electrode and in having the patient hold the auto-condensation handle in her hands. In this diagram only 800

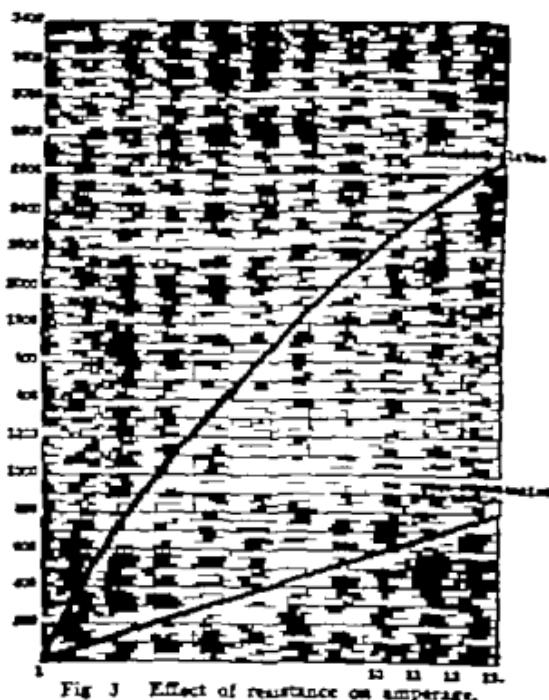


Fig. 3. Effect of resistance on amperage.

Indifferent block-tin or mesh
electrode $5\frac{1}{2} \times 6\frac{1}{2}$ inches

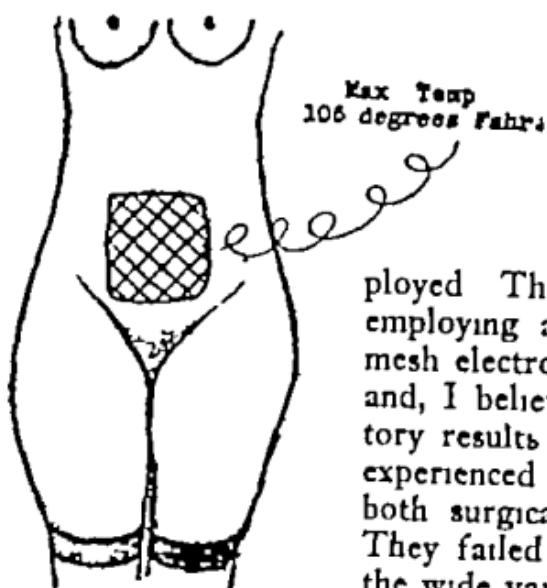


Fig. 4 Regulation indifferent electrode.

should be used for auto-condensation treatments only and for all other work the block tin or mesh electrode, placed opposite and as near the site of operation as is practical, should be employed.

Diagram No. 4 shows the type of abdominal (indifferent) electrode commonly employed, and its proper location. This is a piece of block tin or mesh and is $5\frac{1}{2} \times 6\frac{1}{2}$ inches in diameter. It is applied over the lower abdomen midway between the anterior superior iliac spines with its lower edge about two inches above the symphysis pubis. If it comes too near the bones a certain degree of sparking and unequal heating is produced, which is to be avoided. This is probably due to the greater density of the bones and their consequent higher resistance to the passage of the current.

Another point of importance is the unequal heating effects caused by the pubic hair. Until I conceived the idea of shaving the pubis I could never elevate the intra vaginal temperature above 101 degrees Fahrenheit. Whenever I attempted to go above that, the patient invariably protested about a burning along the pubic edge of the indifferent electrode. We now shave the pubis as a routine measure and find that we have eliminated one of the most serious barriers to the

milliamperes of current was recorded on the meter when the autocondensation handle was used as the indifferent electrode, whereas, 2700 was obtained when the large block tin abdominal electrode was employed. This shows the advantage of employing a large block tin or silver mesh electrode in most types of work, and, I believe, explains the unsatisfactory results sometimes obtained by inexperienced physiotherapists in giving both surgical and medical diathermy. They failed to take into consideration the wide variation in diathermic effects occasioned by the resistance of the tissues. The auto-condensation handle

the treatment. Inasmuch as the gonococcus is attenuated by 104 degrees Fahrenheit it is imperative that such a degree of temperature be obtained.

By using the soap paste containing sodium chloride and shaving the pubis, an indifferent electrode of this size will permit of an elevation of temperature within the pelvis to 106 degrees Fahrenheit, but no higher.

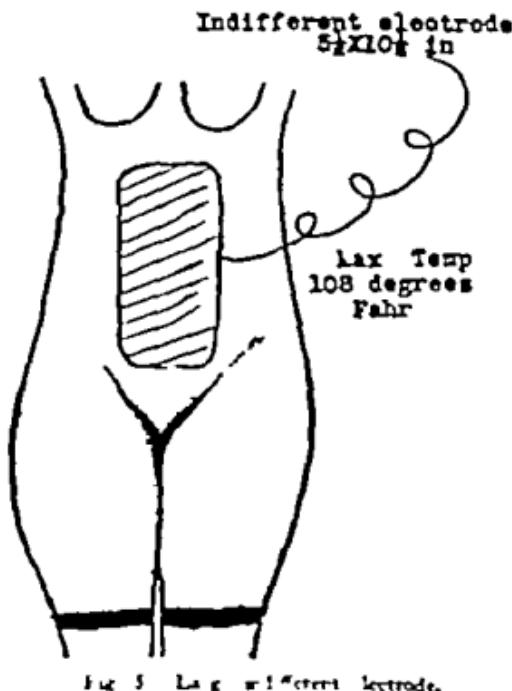
By employing a larger indifferent electrode as in Fig 5 ($5\frac{1}{2}$ x $10\frac{1}{2}$ inches), a temperature of 108 degrees Fahrenheit may be obtained. A cross electrode, as in Fig 6 is quite comfortable and easy to apply but does not add to the intra vaginal temperature.

My most successful results have been obtained by a large form fitting abdominal electrode such as is illustrated in Fig 7. Using this electrode, I have been able to raise the thermometer readings of the Chapman Vaginal Electrode to approximately 112 degrees Fahrenheit which as I shall explain later is the heat tolerance of the tissues, and is sufficiently high to produce an attenuation of the gonococcus and perhaps all other common types of pathogenic micro-organisms.

Fig 8 shows how an indifferent electrode may be placed both anteriorly and posteriorly using a bifurcated cord to make the connection. While this would appear to be a uniformly satisfactory method of distributing the current in giving a general treatment to the female pelvis still it is less satisfactory than the single abdominal plate method for heating effects, 106 degrees being the highest thermometer readings obtainable by this method. Its use in selected cases however, is to be recommended.

Concentration of Current

Another point to consider in this connection is the relative concentration



Double indifferent electrode
sizes $5\frac{1}{2} \times 10\frac{1}{2}$ & $5\frac{1}{2} \times 9$ in

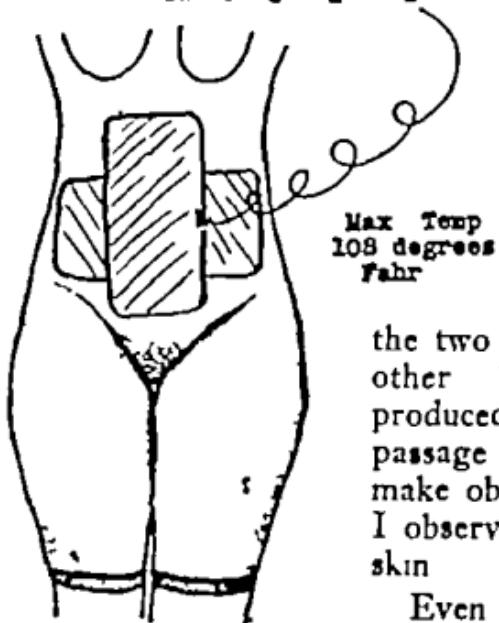


Fig. 6 Crossed indifferent electrodes.

dening on the skin appears along the pubic margin of the plate electrode. I have even pushed the current to the point of extreme discomfort to the patient and find that the erythema first appears in this area and gradually fades out as it extends upwards. Another factor that interferes with the elevation of the amperage is the depression in the umbilicus. Any space underneath the indifferent electrode will produce sparking. To avoid this and to establish a uniform contact, the umbilicus must be filled with some good conductor. For this purpose, I use the soap paste or liquid soap containing a small percentage of sodium chloride. Unless this is done, it will not be possible to elevate the vaginal temperature above 103 degrees Fahrenheit, without discomfort to the patient. Diagram No 9 shows very graphically the relative distribution of the current in these treatments. It has been claimed by some writers that there is a crossing of the electrical impulses at a point between the two electrodes and this opinion is supported by experimental evidence. This effect, however, does not appear in these treatments and it would be a bad thing if it did as such an action would cause a necrosis of the internal tissues that would be exceedingly disastrous.

of the current, with relation to the position of the indifferent electrode. As we all know, the electrical impulses follow the path of least resistance, therefore, all other factors being equal, the greatest concentration of current should be where

the two electrodes are nearest to each other. The fact that the pubic hair produced so much interference to the passage of the current caused me to make observations along this line, and I observed carefully the effects on the skin.

Even after shaving the pubis, when the amperage is raised to the patient's tolerance, the first appearance of red-

Lethal Temperatures

Below are given the heat tolerances of various micro-organisms. This data is taken from the published reports of a number of eminent bacteriologists and its accuracy is beyond question. The lethal temperatures *in vitro* of a few of the more common of these are as follows:

Streptococci—110-125 degrees F. in from 10 to 20 mins.

Staphylococci—140 degrees F. in approx. 30 minutes

Tubercle bacilli—140 degrees F. in approx. 20 minutes

Gonococci—140 degrees F., in approx. 30 minutes

You will note that the lethal temperature of the gonococcus is as high as any of the others and much higher than that of the streptococcus that deadly micro-organism that is responsible for perhaps 90 per cent of the deaths from septicemia originating from criminal operations and occasionally following child-birth. Taking this factor into consideration think how many unfortunate women may be saved by this valuable modality if used in time.

The degree of temperature required to attenuate other bacteria is not as well known as that of the gonococcus but observations that I have made indicate that the gonococcus is above the average in resistance and this observation is borne out by the figures quoted above. Corbus and O'Conor state that the gonococcus is killed (*in vivo*)

by 104-108 degrees F. in 40 minutes. This statement does not compare with my observations, which would indicate that it is rather optimistic. However we must take into consideration the effect of the blood stream upon the bacteria. Induced by the high temperature there is a great influx of blood to the part with a concentration of the opsonins agglutinins and other bacteriolysin enzymes of the blood stream with a consequent attenuation of the invading micro-organism and greater phagocytosis, i. e. a raising of the opsonic index and a stamping out of the infection by na-

Very large block tin or mesh
indifferent electrode 12x14 $\frac{1}{2}$ in.
Max Temp
110 plus degrees
Fahrenheit

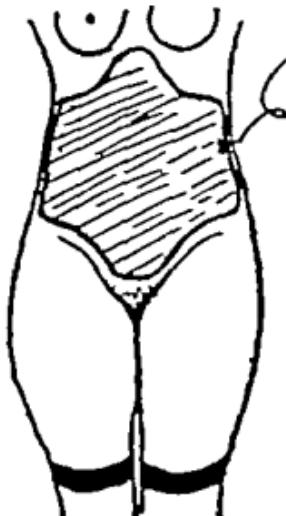


Fig. 7 Extra large indifferent electrode.

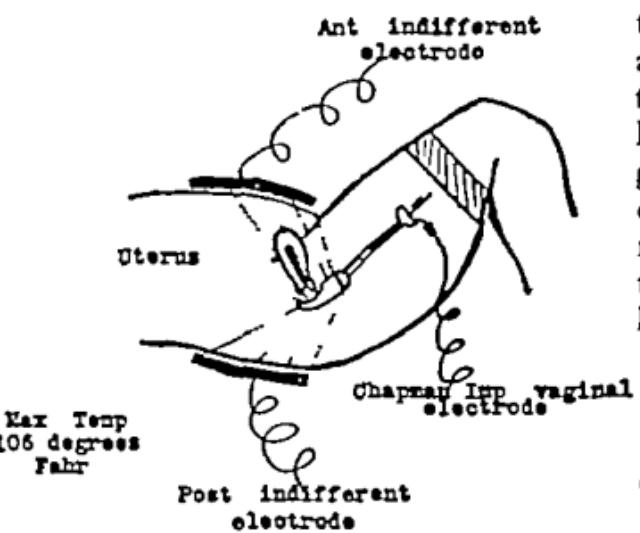


Fig. 8. Showing use of both anterior and posterior indifferent electrodes.

ture's process. This reaction, combined with the specific action of the heat upon the micro-organism, accounts for the difference in the resisting power of the bacteria to the action of heat *in vivo* and *in vitro*.

Heat Tolerance of Patient

Another point for discussion. It has been stated by some physiotherapists that the normal tissues will resist

temperatures of from 130 to 160 degrees F without damage. Observations made at this clinic certainly do not support the above statement. In order to test this point I had a number of persons immerse their hands in water heated to their tolerance. The average temperature that could be tolerated with comfort was 112 degrees F.

I was able to hold my hand in water heated to 115 degrees F., but the skin was quite reddened and I experienced considerable discomfort. One woman who was accustomed to having her hands in hot water could tolerate 120 degrees F. but this was the exception. These findings are in line with the heating effects we have obtained with the electrode as no patient has, as yet tolerated a temperature above 112 degrees F., and all complain when the thermometer registers above 111 degrees F. However this temperature is well above the 104-108 degrees F., generally accepted as necessary for the successful stamping out of infections.

Features of the Electrode

The Chapman Electrode is constructed to conform with the anatomy of the parts to be treated. The instrument should be lubricated with glycerine or soap lather preferably the latter and is rotated at an angle of 90 degrees from the horizontal plane for introduction into the vagina. As soon as the body of the electrode passes the external vaginal orifice it virtually snaps into position and requires considerable force to remove it. After introduction, the electrode is pushed to the extreme

posterior fornix of the vagina and then rotated to the horizontal position. When this is done, the cervix uteri is automatically engaged within the cervical bowl and is held there, while the anterior lip of the cervical bowl enters the posterior forchette, so that there is no portion of the field that is not covered by the current.

The value of this factor in the treatment of endometritis can readily be appreciated. The hymenal portion of the vagina closes around the insulated vulval groove and helps to hold the electrode in proper position.

Another factor—the vagina tolerates temperatures in excess of that of the skin so that with this instrument, it is possible to elevate the intra vaginal temperature greatly in excess of what would be possible if the non insulated tip came into contact with the external skin. The cord connection should pass down between the legs of the patient and by its downward pull elevate the uterus and bring it closer to the indifferent electrode on the abdomen above, permitting greater concentration of electrical energy and also aiding in preventing the electrode from rotating.

Employing this improved electrode which carries a thermometer that registers accurately the degree of thermic effect obtained at all times, we know exactly what we are doing. I was considerably discouraged when I found that I was only obtaining about 101 degrees Fahrenheit inside the vagina, but immediately set about trying to correct this hence the discoveries that I have mentioned. It is hard to conceive that so simple a thing as the pubic hair or the umbilical depression should make a difference of ten degrees in the heating effects and decide for the success or the failure of a valuable therapeutic agent but such proved to be the case and the value of this thermometer attachment cannot be overemphasized. In simple language it takes the treatment of gynecological infections by diathermy out of the field of guesswork and makes it a truly accurate and scientific procedure beyond the scope of mere luck as has been true to a large degree heretofore.

Fig 10 gives a mid sagittal view of a female pelvis showing the elec-

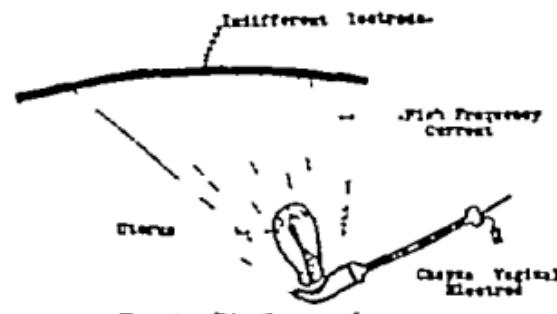


FIG 9 Distribution of current.

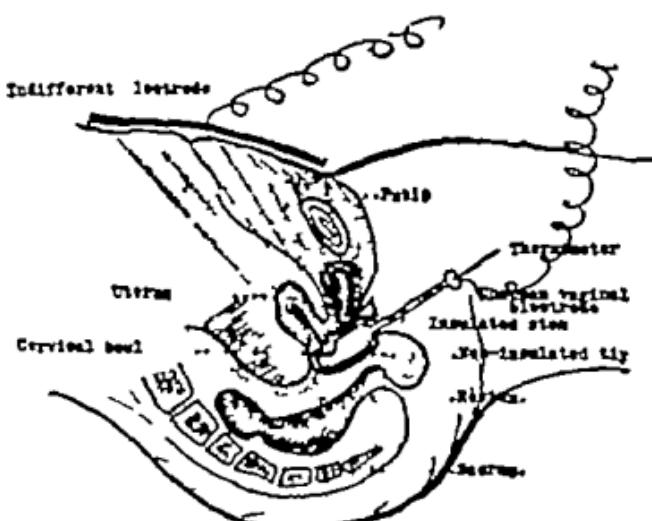


Fig. 10. Cross section of female pelvis showing Chapman Vaginal Electrode in position.

to call your attention to how the pulse rate runs almost parallel with the temperature readings of the electrode, also how the general temperature of the body is elevated less than one-half of one degree. This is brought out more graphically in the single treatment graphed on No. 12. These charts are self explanatory and their study gives much useful information. Note how in this treatment, the temperature of the vaginal electrode, which stood at $110\frac{1}{2}$ degrees F. dropped one and one-half degrees when the patient broke into a profuse perspiration, altho the voltage and amperage were maintained the same. The pulse however as well as the general temperature was unaffected. This was undoubtedly caused by a vasodilatation with a great influx of blood to the pelvis induced reflexly by the high temperature, which as you will note by referring to the graph had about reached the tissue tolerance.

This is a beautiful illustration of how nature provides for emergencies and in this instance, attempts by the neutralizing action of the blood stream to combat the excessive temperature which threatens the life of the normal tissue cells. The value of this great influx of fresh blood in the stamping out of an infection can be appreciated. I also wish to call your attention to how the temperature and pulse readings fell almost parallel with each other and were restored to the normal in ten minutes, while the general temperature curve dropped to its normal almost immediately. This patient had a nasty intra-uterine infection and was already running a temperature of 99.2 degrees F. The relation of the amperage to the intravaginal thermom-

trode in proper position and its relation to the location of the pelvic viscera. The dotted lines indicate the course of the current. By this diagram the wide scope of therapeutic possibilities may be appreciated.

Graph No. 11 gives the mean of fifty treatments in women ranging in weight from 120 to 140 lbs. I wish

eter readings is given on both of these graphs. Their comparison is very interesting and instructive. They show exactly what may be expected at given auto-control settings and if such effects are not obtained there is an error in the technique somewhere, or in the apparatus and it should be corrected.

Summary

Only the more potent factors have been mentioned in this article, but if the reader will study the graphs and drawings he will readily acquire a vast amount of valuable information not only regarding the treatment in gynecology but about diathermic effects in general. The main factors to which I wish to call attention are

- 1 The application of diathermy in the treatment of pelvic infections in women especially those caused by the gonococcus
- 2 The application and advantages of the improved vaginal electrode with the thermometer attachment.
- 3 The influence of the size shape and position of the indifferent electrode on the thermic effects obtained also the influence of the umbilical depression and the pubic hair in producing a poor conductivity of current thereby preventing an elevation of the temperatures sufficient to obtain satisfactory therapeutic effects.
- 4 The temperature tolerance of the tissues which contrary to statements generally accepted heretofore was found to be approximately 112 degrees Fahrenheit.
- 5 The relation of the pulse-curve to the temperature readings of the vaginal electrode also the fact that while the local temperature may be elevated almost to the point of cell coagulation there is less than one half of one degree elevation in

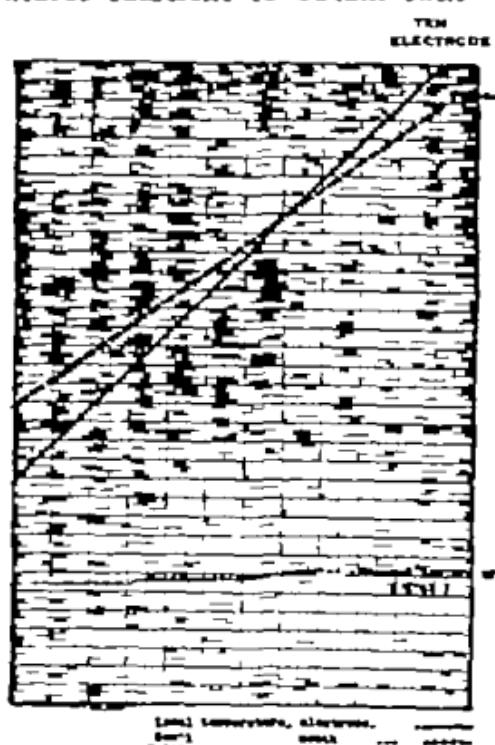


Fig. 11. Relation of temperature of electrode to body temperature and pulse.

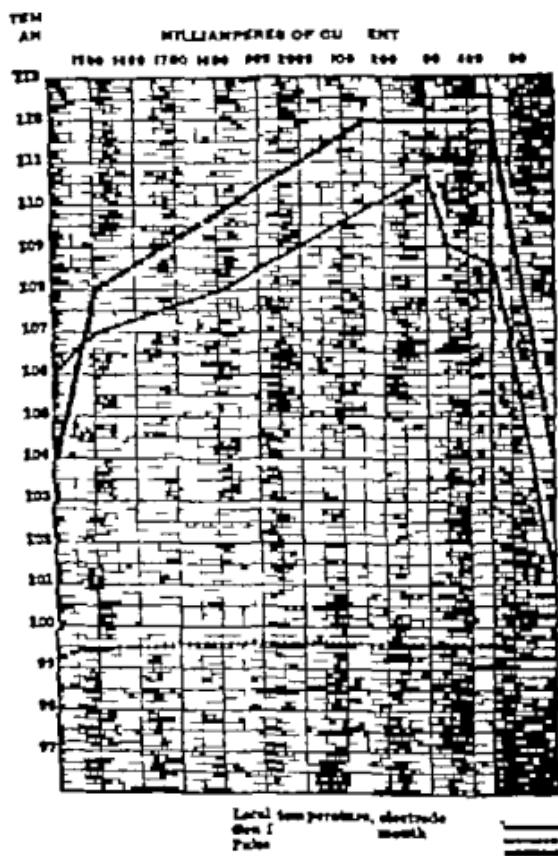


Fig. 12. Chart of typical Diathermy Treatment.

our dosage accurately avoid sources of error and treat infections of the internal female organs with a scientific degree of accuracy and a high percentage of success

the general body temperature.

- 6 The rapid restoration of the pulse and temperature to normal, following treatment

Previous to the use of this special vaginal electrode with the thermometer attachment, the treatment of pelvic infections in women by diathermy was largely a matter of guess-work, although very satisfactory results were often obtained. Now, however, we have a therapeutic agent of great efficiency by means of which we may compute

Treatment of Gonococcal Infection by Diathermy

By E. P. CUMBERBATCH M. A., B. M., B. Ch. (Oxford),
D. M. R. E. (Cambridge), M. R. C. P. (London)

In this communication I propose to describe the methods which we have been using and the results which we have obtained in the treatment of gonococcal infection by diathermy. This method of treatment has been used for many years in my department at St. Bartholomew's Hospital. We have found it extremely effective and the best therapeutic results have been obtained where other methods have failed.

The treatment of gonococcal infection by heat is a rational procedure because the organism can be destroyed at a temperature insufficient to damage the living tissues. This was known before the days of diathermy and attempts were made to cure anterior urethritis by introducing heated sounds into the infected channel and to relieve arthritis by directing currents of hot air on the inflamed joints. These methods were unsuccessful because the application of heat to the skin or mucous membrane does not raise the temperature of the parts which lie more than a trifling distance below the surface. In diathermy however the heat is not applied "ready made" to the surface. It is actually produced in the tissues themselves, along the path taken by the current. If then we are able to direct the current through the regions which are infected by the gonococcus and obtain a suitable temperature the organism will no longer be able to survive.

Attempts were made many years ago soon after the introduction of diathermy to cure gonorrhoeal urethritis in men by this method of treatment. They do not seem, however to have been very successful. The application of a uniform degree of diathermy to the male urethra in its entire length is very difficult and it is questionable whether a satisfactory method has yet been discovered.

The treatment of gonococcal infection by diathermy in England originated in the following way. Soon after the introduction of diathermy into St. Bartholomew's Hospital

by my predecessor the late Dr Lewis Jones, in 1910 I commenced to investigate the effect of the new treatment on various forms of arthritis. The results obtained in gonococcal arthritis were so good that the action of diathermy was investigated in cases of gonococcal infection of the testis and epididymis, cervix uteri and urethra in women, the prostate and seminal vesicles, and later the Fallopian tubes. Last of all the treatment of anterior urethritis in men was investigated.

Since 1919 I have had the co-operation of my colleague and former pupil Dr Robinson who has made many valuable suggestions and overcome many difficulties in technique. But for his help the investigation could not have been continued.

The earliest experience at St. Bartholomew's Hospital, was thus obtained in cases of gonococcal arthritis. At first diathermy was applied to the joints themselves, but we have since learned that it is necessary to apply the treatment to the primary foci from which the secondary infection is disseminated before the arthritis can be brought to an end. We have also learned that efficient application of diathermy to the primary foci, viz. the prostate and vesicles in the male and the cervix uteri in the female, will bring the arthritis to an end even if the joints are not included in the treatment. We have also found that gonococcal infection of the testis, epididymis and vas deferens can be brought to an end by applying diathermy to the prostate and vesicles only. So also the infection of the tubes and ovaries in the female can be brought to an end by applying diathermy to the cervix uteri only.

It is now our custom to give a thorough and complete course of diathermy to the prostate and vesicles in men whatever parts are infected in addition. But, as I shall show later it is advisable in cases of orchitis and epididymitis, to include the contents of the scrotum in the diathermy during the early part of the course. In women we give a thorough and complete course of diathermy to the urethra and cervix uteri, even if the joints and fibrous tissues or the Fallopian tubes and ovaries are infected in addition. But if the tubes are infected we have found it necessary to apply diathermy to these parts before commencing

the treatment of the cervix. The reason for this will be shown shortly.

I shall now describe the method evolved by Dr Robinson and myself for applying diathermy to the cervix uteri and urethra in women. The details of this method were worked out, one by one after prolonged trial of others, and we have found it the most satisfactory. We always treat the urethra first, whether it is infected or not because the strength of the current applied to this part furnished the guide to the correct strength of current for the insensitive cervix. As soon as the urethra has received its first application of diathermy we treat the cervix. This completes the first seance. At the second and succeeding seances we proceed in the same manner and always treat the urethra before the cervix.

The details of our electrodes and technique are the following. The urethral electrode is a thin walled metal tube 6 in long and $3/16$ in in diameter. One end is rounded and closed, the other carries a terminal for attachment of the cable from the diathermy machine. One and one-half inches from the rounded end is an ebonite disc. Beyond the disc the wall of the tube is removed in part. A thermometer is placed in the tube so that its bulb rests at the closed end and its scale can be read through the side opening in the tube. The patient lies on her back and that part of the tube which lies between the closed end and the ebonite disc is introduced into the urethra. The end carrying the terminal is supported on a special stand and connected by a cable to the diathermy machine. The circuit is completed by a belt electrode of thin sheet lead $3\frac{1}{2}$ in wide and of length sufficient to pass around the pelvis with its free ends overlapping. It is placed around the pelvis in contact with the bare skin and its ends are secured by a special clip. The current is now started. It is increased little by little. The patient feels aware of a sensation of heat within her urethra. The current is cautiously increased until a point is reached at which the patient feels the sensation changing to one of pain. At this point the current is slightly reduced until the pain just disappears. The reading of the ammeter is carefully noted and the current allowed to remain at this strength for ten minutes. It is then reduced to zero. By means of the thermometer (which must be calibrated to

allow for errors arising from its situation in a metal tube) we have found that the change of sensation from heat to pain occurs between 114 and 115 F. The more the confidence and co-operation of the patient are secured the nearer to the latter figure will the change be found to occur.

A speculum is now passed into the vagina and the external os of the cervical canal brought into view. The cervical electrode consists of a flexible metal rod made of a tin lead alloy. It is 14 in. long and 8/16 in. in diameter. It is graduated and a rubber tube is passed over it. This tube is 12 in. long and its internal diameter is a trifle larger than that of the metal rod so that it can slide easily over the latter. The rod is bent to an obtuse angle at a point $\frac{3}{4}$ in. from the end so that it can be readily inserted into the canal of the cervix. It is placed in position in the canal and the rubber tube is pushed down over it until its inner extremity makes contact with the cervix. The position of the outer end of the tube in relation to the graduation lines on the rod will show how far the latter has been introduced into the cervix. The length of insertion is usually $\frac{3}{4}$ inch. The outer end of the cervical electrode is supported on the stand previously mentioned and the belt electrode is allowed to remain in position. The current is started and increased until its value is one half of that used for the urethra and it is allowed to flow for 10 minutes. The temperature reached in the mucous membrane of the cervical canal will be the same as that attained in the urethra this is so because the current-density is the same in both parts. Since the cervical electrode was inserted for $\frac{3}{4}$ inch. (i.e. for half the length of insertion of the urethral electrode) the area of contact of tissue and metal is one half of that which was made when the urethra was treated. But as the current used for the cervix was half that used for the urethra the current-density is the same in each part. It may therefore, be concluded that the same temperature will be reached in each part. That this conclusion is correct has been proved by the use of a cervical electrode containing a thermometer.

In practice we do not use electrodes containing thermometers, either for the urethra or the cervix. A cervical electrode containing a thermometer is not a handy instrument. It is rigid and inflexible. All our earlier work in the

devising of technique was done without the use of thermometers, and we still prefer to rely on the sensations of the patient rather than on the readings of thermometers when treating the urethra. This confidence has not been misplaced. In no case have we damaged this sensitive part or produced any reaction sufficient to cause painful micturition. The difficulty which long baffled us, viz., that of procuring a known temperature in the insensitive cervix, has been overcome by using the method just described. The cervix can be heated higher than 114 F without producing apparent structural damage but we think that the self protective powers of the tissues against invading organisms may be lessened by heat greater than 114 F. We also believe that heat sufficient to cause pain will inhibit these powers. For these reasons we do not heat infected tissues higher than 114 F.

In multiparae the urethra and canal of the cervix will admit an electrode 3/16 inch in diameter. In nulliparae the urethra will admit an electrode of the same diameter but the canal of the cervix is narrower and an electrode of smaller diameter must be used. The current used for the cervix must therefore be less than a half of that used for the urethra. Its strength must be calculated from the area of contact made by the narrower electrode with the cervix so that the current-density is the same in the cervix as in the urethra.

If the internal os of the canal of the cervix is patent the electrode will slip easily into the lumen of the body of the uterus. When this happens we think it likely that the mucous membrane of the uterus has been infected. We then pass the electrode as far as the fundus and note the length of introduction. The current must then be more than a half of that used for the urethra. Its exact value must be calculated so that its density is the same as that used when the urethra was treated.

When we think it inadvisable to pass a speculum into the vagina in adult or adolescent women we apply diathermy to the uterus by the rectal route. Our method is the same as that which we use for the treatment of the prostate. This will be described shortly. We use a similar method in children and infants. Our youngest case of gonococcal infec-

tion—proved by the discovery of gonococci—was in a girl of 5. We have also applied diathermy by the same method, to two infants of $2\frac{1}{2}$ years of age. In patients of such tender age we use currents not stronger than one or one-and-a-half amperes, and do not attempt to procure a temperature higher than 105° F. Otherwise they become restive and uncomfortable.

To subject the prostate and vesicles to diathermy we pass an electrode into the rectum and complete the circuit by the belt electrode already described. The rectal electrode is a hollow metal case 8 in. long oval in cross section measuring $\frac{1}{2}$ in. in its longer diameter. One end is rounded and closed the other end carries a terminal. In its interior is a metal case for a thermometer. The rounded end is passed through the anus and introduced for four inches, this is usually the maximum length for which it can be inserted. The outer end of the electrode is depressed on to the level of the couch by a sand bag. The circuit is completed by means of the belt electrode placed around the pelvis. The current is gradually increased. The patient feels a sensation of heat in the rectum. The heat increases and a point is reached when the sensation becomes disagreeable and aching. This occurs at about 112° F. It does not appear to be actual pain but is unpleasant. The current is then reduced until all unpleasant sensation disappears and it is allowed to flow for 20 minutes. The seances, 6 to 8 in number are held twice weekly.

It is possible that the aching sensation is due to swelling of the prostate in its capsule. If a narrower tubular electrode $\frac{1}{4}$ inch in diameter is used in place of that described above, the ache is not so apparent, and we have been able to increase the rectal temperature to 114° F when a definite sensation of pain is produced. With the narrower electrode the greater degree of heat is more localized around the metal tube and there is perhaps less swelling of the prostate.

In the method which I have described above it is uncertain whether the seminal vesicles are subjected to diathermy in their whole length. The distal half of each vesicle lies beyond the innermost end of the rectal electrode. We believe that if the distributing electrode is placed, not around the pelvis, but higher up around the waist, the

vesicles in their entirety will be heated. The application of the sand bag to the end of the electrode presses the prostate forward toward the anterior abdominal wall, the electrode acting as a lever and the anus as the fulcrum. The distal portions of the vesicles must therefore come to lie across the inner end of the electrode. If now the belt electrode is placed around the trunk at a higher level, i. e. around the waist, the lines of flow of the current will pass oblique-upwards and outwards between the electrodes and traverse the vesicles in their entire length as well as the major part of the prostate. The position of the directing electrode around the waist is therefore the best when we wish to apply diathermy to the vesicles in their entire length. We believe, however that in either position of the directing electrode there will be a spread of heat by convection to all parts which are close to the active electrode but out of the direct line of fire between the two electrodes.

It is evident that the temperature reached in the prostate must be lower than that indicated in the rectum. We believe that the prostate attains a temperature of about 108 F. We have applied diathermy to the cervix in women by means of a rectal electrode similar to that described and have found that a thermometer in the canal of the cervix shows a temperature of 108 F. Since the prostate and cervix both bear the same relation to the rectal electrode we think we are approximately correct in saying that the interior of the prostate attains a temperature of 108 F. Since we are unable to subject the prostate to the same temperature as that reached in the urethra and cervix in women we compensate for it by holding more sessions and making them longer. It has been shown that a lower temperature will kill the gonococcus if the duration of the exposure is lengthened. The figures obtained by experiment are not, however of much guide in therapeutic work because the conditions attending experimental work and clinical therapy are different. We are also of the opinion that the action of diathermy is not entirely on the gonococcus itself. We believe that the heat also increases the self protective powers of the infected tissues. The maximum temperature which the tissues can tolerate without pain is about 114 F and we do not think it advisable to proceed beyond it. At this

temperature we think that the action of diathermy is mainly a direct one, on the organisms themselves. At lower temperatures we believe that the action is more indirect, stimulating the tissues to remove the infecting organisms, but, nevertheless, diminishing the vitality of the latter.

In cases of arthritis we have found it unnecessary to apply diathermy to the joints themselves. The treatment of the prostate and vesicles or cervix and urethra is sufficient to bring the arthritis to an end. So also is the treatment of the prostate and vesicles sufficient to bring orchitis and epididymitis to an end but we found that pain could be more quickly relieved by including the scrotum in the diathermy. We therefore replace the directing (belt) electrode by a second active electrode and apply it to the scrotum the rectal electrode remains in position. After the first three seances the scrotal electrode is replaced by the belt electrode and five more seances are held. The three applications to the scrotum are, as I will show sufficient to bring the orchitis and epididymitis to an end. The prostate and vesicles receive some diathermy when the scrotum is being treated, but they are more adequately treated when the belt electrode is placed round the trunk. It is absolutely imperative to give thorough treatment to the prostate and vesicles if the action of the diathermy on the testis and epididymis is to be permanent.

If salpingitis is present it is imperative to treat the cervix by diathermy if the infection of the tubes is to be permanently abolished. We found, however that the application of diathermy to the cervix, in cases of salpingitis, caused pelvic pain. The pain developed during the application and lasted for a day or even a week. We found that this pain could be prevented by the following procedure. During the first three seances (given bi weekly) a gentle application of diathermy is given to the uterus and its appendages by means of a vaginal electrode, the circuit being completed by the belt electrode placed around the waist. The current should not exceed one-and-a-half amperes. Diathermy can then be concentrated on the cervix by the method already described.

If the ligaments and bursae of the feet are infected it is necessary especially in cases of long duration to prescribe

massage and remedial exercises because the patient adopts faulty position of his feet when he walks in the effort to reduce pain. Diathermy is an excellent preliminary to this treatment.

I shall now describe in brief the results which we have obtained. We have treated 52 cases of gonococcal arthritis. The youngest case was a girl of 8 the oldest a woman of 60. In many cases a single joint, usually the knee was affected. In a few cases many joints were affected. Most of the cases were out patients some were in patients and a few had been confined to bed for long periods. In all these cases the treatment of the primary foci by diathermy brought the arthritis to an end. Early cases in which no permanent structural changes had occurred were cured. In advanced cases in which these changes had taken place the arthritis was arrested pain was abolished, swelling was reduced and the range of movement increased. These advanced cases were subjected to treatment by massage and movement after the diathermy was completed and further improvement was effected. This additional treatment caused no return of the arthritis. In all the cases which we were able to keep under observation the therapeutic effects were maintained.

In all our cases of gonococcal orchitis and epididymitis, 48 in number the pain tenderness and swelling were brought to a rapid end. Pain actually began to lessen during the first application of diathermy to the scrotum. After three applications and the expiration of 10 days there was no pain no swelling and no tenderness. In two cases only were more than four applications necessary. In many of the cases there remained some thickening of the globus minor but not tender to pressure. A continuation of the diathermy does not seem to reduce this thickening. In no branch of therapy have we obtained results more constant and successful than those following the treatment of gonococcal orchitis and epididymitis by diathermy.

In gonococcal salpingitis provided that there was no pus or pent up fluid in the tubes we were able to abolish the pain and reduce the swelling to a slight degree or render it impalpable.

We have had two cases of gonococcal iritis. One of these was early and severe pain was present. It was quickly relieved by applying diathermy to the orbit. In the other case the iritis was quiescent and there was no pain. It was partly adherent and the ophthalmic surgeon would not perform iridectomy unless we could assure him that gonococcal infection was everywhere extinct. We therefore gave an extra course of diathermy to the prostate and vesicles in order to be sure, as far as possible, that the infection had been abolished. The iridectomy was then successfully performed. There were no sequelae.

We are now confronted by a question of the utmost importance. Will diathermy in addition to bringing metastasis to an end free the primary foci from infection? Can we say that the urethra and cervix no longer contain gonococci? Can we say that the gonococcal infection of the prostate and vesicles has been rendered extinct? The final answer to these questions can only be made when a positive test of freedom of the tissues from gonococci has been discovered. Until this long-desired test has been discovered we must rely on bacteriological evidence, on signs and symptoms and the subsequent histories. Gonococci, which were previously found in spite of other forms of treatment, disappeared after diathermy and repeated search at intervals failed to find them. The examination of the cervix reveals nothing abnormal. On tapping it the fluid which emerges from the os is clear and glycerin like in appearance. Symptoms, such as pain irritation and discomfort on micturition when present, disappear after diathermy. In our cases of prostatitis the discharge disappeared though in some, a morning gleet persisted. Examination of the fluid obtained by massage of the prostate revealed no gonococci although, in two cases, a provocative injection of gonococcal vaccine was made. In two of our cases of gonococcal infection in women the patients married after the treatment and there was no transfer of infection, in one case after 5 years in the other after nine months.

The evidence therefore favours the conclusion that the infection of the primary foci has been abolished although it does not prove it. But we can say for certain that diathermy was able to render all evidence negative where other forms of treatment had failed.

We have also treated by diathermy a few cases in which the anterior urethra alone had been infected. In some of these the discharge soon disappeared in others it disappeared but not more quickly than would probably have been the case if other methods had been used. We have tried four different methods of applying the diathermy on two of these the anterior urethra was subjected to the treatment in two the whole urethra was treated simultaneously. In neither of these methods have we used a bougie electrode for fear of spreading the infection. The bougie method is open to another objection. The distance between the active electrode (the bougie) and the distributing electrodes (which are placed on the back and front of the pelvis and on the perineum) is short in some parts and long in others. The current will therefore be concentrated in the shorter paths and the urethra will not be evenly heated. Attempts have recently been made in France to overcome this difficulty by introducing resistances in parallel between the electrodes with the object of making the paths between the active and distributing electrodes present the same resistance everywhere. This seems to me a task of no ordinary difficulty and I doubt whether an adequate application of diathermy to all parts of the urethra simultaneously would at the same time, be an efficient application to the prostate and vesicles.

Our conclusions are the following

1 The application of diathermy to the cervix or prostate and vesicles—the gates to metastasis—is a specific for gonococcal arthritis early cases are cured and late cases arrested

2 Diathermy is a rapid and certain method of bringing gonococcal orchitis and epididymitis to an end

3 The symptoms and (usually) the signs of gonococcal salpingitis can be removed by diathermy if there is no pus or pent up fluid in the tubes.

4 All evidence of gonococcal infection of the urethra and cervix uteri in women and of the prostate and vesicles in men is negative after diathermy

The Results of Diathermy in Pelvic Infections

By THOMAS H CHERRY, M D
NEW YORK CITY

The intractable nature of gonorrhreal intrapelvic infections such that any form of therapy which holds out any hope of reaching and destroying the gonococci in these hidden recesses deserves investigation.

Dr Cherry was spurred on to try the effect of diathermy on adnexal diseases of gonorrhreal origin as a result largely of favorable results reported by Corbus who employed the frequency current in the treatment of gonorrhreal urethritis and endocervicitis.

Dr Cherry was placed in an unusual position for conducting an intensive investigation as he was able to select a large number of patients which he could keep under constant observation over a period of time and in that manner check up accurately the results of his work.

The patients selected for investigation and treatment numbered 100 in all being selected from the Gynecological Department of Harlem Hospital, New York City.

RATIONALE

The principle underlying the use of diathermy in gonorrhreal infections depends upon the well known fact that the gonococcus will die if exposed for ten minutes to a temperature of 55 degrees Centigrade.

Diathermy consists of generating heat within the tissues by means of an electrical high frequency current passed between two electrodes placed externally.

REGULATING TEMPERATURE

Since tissue is definitely destroyed at a temperature of 55 degrees Centigrade and since the amount of heat which tissues will tolerate probably does not exceed a temperature of 55 to 58 degrees Centigrade it is vitally necessary to be in a position to control the heated diathermy within fairly narrow limits. Fortunately this is possible as the temperature developed between the electrodes of a high frequency current depends upon the size of the electrodes the amount of

utilized the duration of the application and the density of the tissues treated

FOCUSING THE HEAT ON THE AFFECTED PART

The depth of heat penetration can readily be regulated by varying the comparative sizes of the two electrodes. Where two electrodes of equal size are used maximum temperature developed will be equi-distant from each. When electrodes of different sizes are employed the greatest degree of heat will be near the small one.

In order to concentrate the desired degree of heat on the affected adnexa preliminary experimental work was carried out on the cadaver using different types of electrode.

Without going into detail it was found experimentally that with an abdominal electrode measuring 18×12.5 cm. and a vaginal electrode the active surface of which measured 5×3 cm. it was possible to heat the adnexal region to 46 degrees Centigrade. The actual vaginal temperature recorded on the thermometer attached to the vaginal electrode registered 44 degrees Centigrade.

RESULTS OF CLINICAL APPLICATION OF DIATHERMY

Realizing that electrotherapists and authorities on physiotherapy have objected to the principle of employing diathermy in cavities containing pus in which no outlet is present for drainage Dr Cherry feels constrained to give his reasons for employing the method on some of his patients who presented large pyosalpinges or tubo-ovarian abscesses.

Dr Cherry argues that if the gonococcus is the inciting factor producing such pelvic lesions and if the penetration of the diseased structure by heat could be maintained the causal agent would be destroyed with an incidental reduction of the inflammation.

Furthermore he argues the active hyperemia produced should aid in the rapid absorption of the products of infection and should promote resolution.

In this series of 100 patients presenting adnexal disease the gonococcus was identified as the causal factor of the trouble. All patients had an accompanying endocervicitis — some had urethritis, Skene's duct involvement or bartholinitis which in Dr Cherry's opinion classed them as of gonorrhreal origin.

Among the series of 100 patients 77 presented pelvic or ab-

domino-pelvic masses while the remaining 23 patients without masses nevertheless presented thickened and tender adnexa.

METHODS OF ADMINISTERING DIATHERMY

In the course of the series of treatments three methods of applying the electrodes were tried namely abdominovaginal, abdominorectal and abdominosceral. Of these the abdominovaginal appears the most practical. It was attended with less discomfort to the patient than the rectal route and it required less time and less current to produce the desired pelvic temperature than in the case of the sacro-abdominal route.

ABDOMINOVAGINAL TECHNIQUE

Abdominovaginal applications consisted of applying an abdominal electrode above the pubes and in contact with the skin while the vaginal electrode through which the thermometer was inserted was placed behind the cervix and in contact with the vaginal vault. The current was regulated so that the vaginal temperature was raised to 42 or 43 degrees Centigrade. This required 1500 to 2500 milliamperes. The maximum temperature in the inflamed adnexa was estimated at around 44 or 45 degrees Centigrade. When this point was reached the current was stabilized and a uniform temperature maintained for 15 to 30 minutes. Treatments were repeated at three to five day intervals.

As all these patients had a co-existing endocervicitis, the cervix was also treated either at the same sitting or at another time administering diathermy by means of the Corbus thermophore. Where patients had an associated urethritis the urethra was treated in the same manner as the cervix. In the case of the cervix or urethra the amount of current utilized varied from 500 to 1000 milliamperes.

RESULTS OF TREATMENT

In the endocervicitis group 48 patients were treated, of which 24 were cured or markedly improved and 24 showed no improvement at all.

Dr Cherry considers that the application of low degrees of heat (from 42 to 43 degrees Centigrade) to the cervical canal is efficacious only in acute or subacute inflammation of the endocervix. In the chronic type of case it is preferable to entirely destroy the infected area by coagulation from the internal to the external os.

In the urethritis group out of 13 patients treated 6 were cured 6 improved and 1 not improved

Dr Cherry lays great emphasis on the importance of clearing up the lower genital tract infection as a means of preventing reinfection of the adnexa

IN PATIENTS WITH ADNEAL MASSES

Among the 77 patients who had pelvic masses there was complete disappearance in 18 instances reduction in size in 14. The complete disappearance of the pelvic masses seemed more apt to occur in those having an initial attack of adnexal infection.

Of the 77 patients having adnexal disease with masses, 49 were entirely relieved of symptoms operation being unnecessary or refused by the patient

THE PRE OPERATIVE EFFECT OF DIATHERMY

Of the 28 patients whose adnexal masses persisted operative removal was carried out. It is interesting to compare findings in these patients with others of a similar nature who did not receive pre-operative diathermy. It was found at the time of operation that the pelvic structures appeared more hyperemic. They were soft edematous and smooth. The adhesions were vascular and thin and quite unlike the thickened fibrous structures usually seen. As a result rapid removal of the masses was facilitated.

On examination of the contents of the masses following removal it was found that instead of the usual thick creamy purulent exudate the contents consisted of a thin watery straw colored fluid.

It is interesting to note that the post operative convalescence of these patients was remarkably free from abdominal discomfort pain vomiting and distention. Throughout all the cases receiving diathermy applications almost instant relief of pain was observed.

In pelvic infections not of gonorrhoeal origin Dr Cherry's clinical experience has been limited. The few cases coming under his notice have been postpartum infections in which the specific bacteria responsible were the streptococcus staphylococcus and the colon bacillus. Since these bacteria required from 18 to 60 degrees Centigrade to render them inert a lower degree of heat would not only fail to inhibit the pyogenic processes but also produce a suitable cultural environment for their growth.

It is possible diathermy would exercise a beneficial effect in

the chronic rather than the acute type of postpartum exudate but the subject is open to question through failure of clinical evidence one way or the other

SUMMARIZING

Dr Cherry concludes by asserting that diathermy is probably the most satisfactory available agent for the conservative treatment of pelvic infections due to the gonococcus. In this type of case diathermy relieves pain, diminishes the size of the pelvic masses and aids in complete resolution.

As a pre-operative therapeutic measure diathermy will eliminate many of the technical difficulties of operative removal, thereby contributing to a smoother convalescence.

Dr Cherry further emphasizes that the results of diathermy can be greatly improved in private practice. His own clinical experiments were carried out in an institution where it was only possible as a rule to give 15 minute applications. In private work 35 minutes is the minimum duration of each application.

(Digest of an article in J A M A., Vol 86 No 23 June 5 1926)

Physiotherapeutic Treatment of Chronic Gonorrhea and Its Complications

By Carlton L. Rowell, M. D
Chicago Illinois

The above title is perhaps a misnomer, because chronic gonorrhea really is complications. When you speak of posterior urethritis, prostatitis, vesiculitis, Cowperitis stricture, or infection of the glands of Littré, following gonorrhea, you are really speaking of the complications of the disease.

I had occasion to do some of this work with the A. E. F. and I think that anyone who has had much experience with the old line of treatment, which consisted mostly of massage, posterior irrigations and sounds, will agree with me that it has been far from satisfactory. We realized it over there. We would treat some of these cases for five or six months and then start checking up to see if treatment could be discontinued. We would perhaps get two or three negative prostatic smears, take them off treatment for a few weeks, and then another examination would show that they were apparently right where they started.

Realizing that if gonorrhea was to be treated successfully a departure from the old line of treatment was necessary, I started using diathermy—approximately two years ago.

Diagnosis

I am not going to take up the morphology of the gonococcus, the anatomy of the parts involved or the pathology of the disease. That can easily be learned from textbooks on the subject. But I want to go over the matter of making a diagnosis, particularly locating the seat of infection. Suppose we take an imaginary patient coming into the office and outline a plan of procedure to follow until the case is ready to be discharged.

In the first place it is very important before starting treatment to know what part of the genito-urinary tract is affected and frequently this information can be gained only by a most careful examination. The first step is to strip the anterior urethra to determine if material can be obtained for the purpose of examination. If so a smear is made and examined. The patient is then asked to void the first and second specimens of urine being examined macroscopically. The glans penis is then

thoroughly cleansed with alcohol and a rectal examination is made. The condition of the vesicles and prostate is noted and material for a smear is obtained by making a vigorous, but not unnecessarily rough, massage. The urethra and the external surface having been thoroughly cleansed we know that any pus or micro-organisms found in this material must come from the vesicles or prostate, or both.

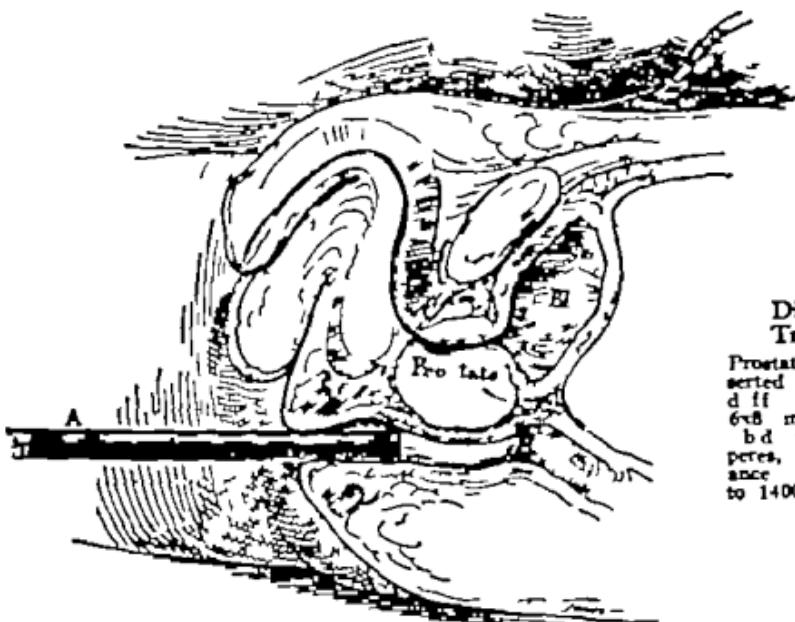
In the absence of the gonococcus, which is rarely found either intra or extra-cellular in a prostatic smear, I give more attention to the amount of pus found than to anything else. The laboratory reports the pus as occasional (from one to three cells to a microscopic field), few (from four to seven to a field), or many (more than eight to a field). An occasional pus cell is regarded as negative, a few as doubtful, while many are considered as evidence that the condition has never been cleared up. Mixed bacteria are practically always found, but, in the absence of pus, I pay very little attention to anything but the gonococcus.

If the first examination is negative another smear is made two or three days later, and if nothing more than a few pus cells is found a third examination is made after three or four days more the material from the vesicles and prostate being cultured in addition to the direct smear examination. The culture is incubated for ten to twenty-one days before being discarded as negative.

At any one of these visits the patient is given a slide and told to obtain whatever material he can by thoroughly stripping the urethra immediately upon arising in the morning. Also an examination is made to determine whether or not there are any strictures. If the meatus is not large enough to admit a number 26F acorn tip a meatotomy wide enough to allow the passage of a number 32F or 34F tip is performed. The size and location of all strictures are noted.

Smears are made from two ejaculated specimens obtained about a week apart and if all of these examinations prove negative the patient is given a provocative injection of one per cent silver nitrate solution and asked to report at the office the next morning before urinating so that it can be definitely determined whether or not there is any urethral discharge. If there is a smear and culture are made.

This same procedure is followed in treated cases to determine when they are ready to be discharged except that they are told to report again after one month's rest, when a smear and cul-



Diathermy Treatment

Prostatic electrode inserted in rectum, abdominal electrode 6x8 in. over lower abdomen. Milbank peres, patient tolerance generally 1000 to 1400.

ture are made from the prostate and also from any material that can be expressed from the urethra. I go into this in such detail to stress the importance of *knowing* when a cure has been obtained and not just guessing at it after one or two care less examinations.

Treatment

Posterior infections are treated three times a week—with diathermy, positive galvanism and sinusoidal massage. I have formed the habit of treating both vesicles as well as the prostate whether or not they are palpable, or a history of epididymitis is obtained.

Diathermy

As a preliminary to this treatment I usually give a posterior irrigation of potassium permanganate leaving a small amount of the solution in the bladder during the treatment. An intravenous injection of mercurochrome or acriflavine can also be given.

For giving a diathermy treatment the patient lies face down with a piece of block tin 6x8 inches applied to the lower abdomen. The prostatic electrode is inserted well into the rectum and turned a little to one side to cover one vesicle. The current is turned on and slowly increased to the individual patient's point of tolerance. I have found that most of them will take

1000 milliamperes and occasionally one will tolerate as much as 1400. After 20 minutes the electrode is turned to the opposite side and the other vesicle treated for a similar period, then the electrode is withdrawn slightly to cover the prostate for another 20 minutes, making an hour in all. Following the treatment the vesicles and prostate are gently massaged.

A variation of this treatment can be given by using a metal electrode in the posterior urethra and a piece of block tin, about 3x4 inches in size on the back or buttocks. I have three special electrodes sizes 22, 26 and 30Γ, 3 inches in length, with a slight curve, which are made to screw onto the regular cervical electrode handle. This treatment is given for 30 to 45 minutes, and it is surprising how quickly the long posterior shreds disappear from the urine.

Galvanism

Either positive galvanism or the sine wave can be used at the next visit two days after the diathermy treatment. Galvanism is given with any good galvanic generator, using the carbon ball electrode in the rectum and the negative electrode over the lower abdomen. I start with 8 milliamperes increasing to 10 milliamperes for the second and all subsequent treatments. The vesicles and prostate can be treated just as with diathermy starting with three minutes to each and increasing the time one minute at each sitting until 7 or 8 minutes is reached. That makes 21 to 24 minutes for the entire treatment, and I have never found it necessary to go beyond that. I also massage the vesicles and prostate following this treatment.

Sine Wave

This treatment is also preceded by a posterior irrigation of potassium permanganate solution as for diathermy. For sinusoidal massage I have been using the Morse Wave Generator with No. 7 cam giving 44 contractions per minute. The same electrode that is used for the negative pole in the galvanic treatment is applied to the abdomen and the metal prostatic electrode inserted in the rectum over the vesicles, and prostate as before. The indirect current hook-up is made and the current increased until the contraction is felt in the rectum. The duration of each treatment is the same as for positive galvanism. None of these treatments should be pushed to the point where they cause the patient the slightest pain.

This procedure, diathermy, galvanism and the sine wave, is continued for four or five weeks when smears are examined to determine what progress has been made. If much pus is still evident, treatment is carried on for another two or three weeks, or until a cure has been effected as shown by repeated negative smears and cultures.

Stricture

This condition presents one of our greatest problems in treating gonorrhea. I have tried a great many things but I believe the best results can be obtained in the majority of cases with a combination of negative galvanism and diathermy. Occasionally, especially where we are dealing with a vascular stricture negative galvanism will aggravate the condition and must be discontinued.

The size of the stricture to be treated is first determined by passing olive tipped bougies until one is found that will just slip through. Suppose this is number 20F. A size 22 is then attached to the negative pole of the galvanic generator and the positive electrode applied to the lower spine with the patient in the sitting position. I use a scale calling for one-half to one milliamperc for a size 16 tip, up to four and a half to 5 milliamperes for a No. 32 tip. The bougie is introduced to the stricture and held in place while the current is turned on and gradually increased to the point desired. With only the slightest pressure the electrode will usually slip through the stricture in from two to eight minutes. If it fails to pass in that time the treatment should be discontinued and a smaller tip used at the next sitting. These treatments can be given every five or six days unless accompanied by much bleeding in which case they should be discontinued until the urethra has had time to heal. I never increase the size of the bougie until the one used at the last treatment slips through the stricture in two or three minutes.

Following each treatment with negative galvanism 30 minutes of diathermy is given for which I use the special electrodes already described with a small piece of block tin applied to the back or buttocks. I find the point of tolerance to be from 300 to 900 milliamperes depending upon how far the electrode is inserted into the urethra. In treating strictures however it is not essential to secure the greatest amount of heat possible as the results are just as good when a milder temperature (103 to 105 degrees F.) is used. This treatment can also be given with a small piece of block tin applied to the under surface of the penis as the indifferent electrode.



Treatment of Stricture

One tipped electrode one size larger than stricture as shown. Indifferent electrode, 6x8 in over lower abdomen. Use gal zinc current, technic as described on opposite page.

Determining when and how to treat a stricture is a matter of individual judgment. It is said that if a stricture is of No 26 caliber or larger it should be left alone. I believe that a No 34 stricture in one patient can cause more trouble than a No 24 in another. It depends upon whether or not it is harboring the gonococcus. If so it calls for treatment not necessarily with the idea of increasing its caliber, but for the purpose of eliminating the causative organism, the presence of which can be determined in some cases only by culturing the morning drop for a period of two to three weeks. One of the most effective ways of ridding a stricture of gonococci and this applies also to the glands of Littré, is by means of the Kohlman dilator, with mercurochrome acriflavine silvol argyrol or any drug of known value. With the patient in a sitting position the instrument is introduced and dilated to a point two sizes larger than the smallest stricture. It is held in a vertical position and the urethra filled to the meatus with the drug to be used. I use mercurochrome (one half to one per cent), acriflavine (1:2000 to 1:500) and neosilvol (25 per cent), and usually about three such treatments of 30 to 45 minutes duration will bring about the desired result. I use all three of these drugs in each case, applying a different one at each sitting. This treatment is still more effective if followed by 30 to 45 minutes of diathermy to the urethra.

Epididymitis

There is no treatment for this distressing condition which in any way compares with diathermy. An intravenous injection of sodium iodide followed by a long diathermy treatment (one to two hours), will in most cases give astonishing results. A small mesh electrode can be very easily applied to the scrotum especially if the patient is wearing a solid elastic suspensory which can be used to hold the electrode in place. The indifferent electrode is applied to the back and the current gradually increased to the point of tolerance. Any treatment of known value can be used in conjunction with diathermy such as intra dermal injections of large doses of Volan or local applications to the scrotum.

Rheumatism

Gonorrhreal arthritis responds just as well to diathermy as do the simple forms. It is applied through the affected joint by means of mesh or block tin electrodes. The adjunct treatment such as the iodide and salicylate of sodium, proper elimination etc., should never be neglected.

Summary

To sum up I believe that physiotherapy has completely revolutionized the treatment of chronic gonorrhea and its complications. We still have a great deal to learn but there is no questioning the fact that results are now being obtained in weeks where months were necessary with the old line of treatment. This is not an over-enthusiastic statement based on a few scattered cases but a fact that is borne out by a great many case histories on file in my office.

Naturally certain cases require longer treatment than others but since adopting the technique outlined above I have not failed in a single case to get negative laboratory reports where the patient could and would follow instructions. Those requiring six months to clear up have formed a very small percentage of the number treated and even these can be cured if the patient is persistent and will co-operate with his physician. In the great majority from 6 to 12 weeks will suffice to thoroughly establish a cure.

Principles of Surgical Diathermy

By Gustav Kolischer, M.D.
Michael Reese Hospital Chicago

IN TALKING about the Principles of Surgical Diathermy, it is necessary that we understand the meaning of the term. Surgical diathermy means the destruction of tissues by the heat that is produced by the passage of electric current. It is absolutely wrong to accept the idea that surgical diathermy is an electrical phenomenon. It has, directly, nothing to do with electricity.

The point is this. It is one of the fundamental laws in physics that no energy can be lost. Energy may be transformed and split up but it cannot be lost, and that is the principle back of the development of heat by electric currents.

If an electric current is partially or entirely stopped, the electric energy is not lost but transformed partially or totally. That is the principle of surgical diathermy. We know that whenever an electric current travels through a body or is forced through it a certain amount of heat will be produced. The amount of heat depends on one hand on the amount of current that is sent through; on the other hand, it depends on the resistance which this body through which the current travels offers to the progress of the electricity.

Our idea is that this electric current consists of the smallest particles of matter—the so-called electrons which build up the atoms, and which are charged with electricity and travel in a certain direction. Thus the electric current effects the transportation of the electricity from one point to another by means of the smallest particles we know of—the so-called electrons.

If those electrons meet with some resistance some obstacle in traveling to another point the greater that resistance the greater will be the transformation of electric energy into caloric energy; consequently the greater will be the amount of heat produced.

You know that heat for a good many centuries was given great preference in dealing with malignant tumors, not only

because it was found that destruction by this means was easier than by the knife, on account of the avoidance of loss of blood but because it seemed the final results in a great many cases were much better

The carrying of heat into the tissues, from the outside is technically very objectionable. In using a cautery or soldering iron you drive the heat only to a certain depth and the minute you apply this instrument to a living tissue you lose heat which cannot immediately be restored. Then, it is absolutely impossible to gauge the degree of heat that you apply to the tissues. It is absolutely impossible by progressing with the cautery in the cauterization of the tissues to change the amount of heat. All these things are eliminated by producing the heat within the tissues.

If we apply a glowing iron to a surface the heat is carried into the tissues from the surface. By diathermy we produce the heat within the tissues themselves.

As to the choice of current you know that whether it is an uninterrupted current or an interrupted current there are always two influences to be noticed. One is a certain amount of decomposition of the matter through which the current flows so-called electrolysis. The other is excitation of certain structures of the body which are susceptible to this excitation.

If we were to use enough of such current, traveling in one direction in the body to produce heat enough to desiccate the tissue then we would bring to bear upon all this living tissue the electrolysis and the excitation we would destroy tissue that we don't want to touch and the responsive structure in the body would be excited to such an extent that a patient would suffer pain and physiologic damage would be done.

In order to avoid that the so-called high frequency currents are used. The principle is this. There are currents that are steady currents and there are currents that reverse their direction. If this reversion is about a thousandth of a second we call it a medium frequency current if however this reversion of the current exceeds a million reversals in one second we call it a high frequency current. In this quick reversion of the current there is not time enough to develop the influence of electrolysis or excitation and these two factors are absolutely eliminated. You can force the current through

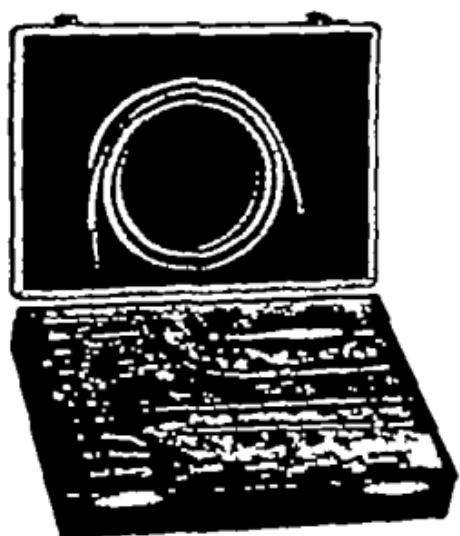
the body—provided it is a current of frequent reversals, about 1,000,000 or 2,000,000 to the second—up to 20,000 volts, and 4,000 milliamperes, without producing an impairment of the general constitution. That is the reason why we employ high frequency currents.

Surgical diathermy means the production of destructive heat within the tissues produced by the resistance that these tissues offer to the current. Whether this destruction is carried to a certain extent or to a higher or lower degree is absolutely within our power.

Now as to the production of the heat, if you take electrodes of equal size the amount of electrical power will be exactly the same at one electrode as at the other. Consequently, all the tissue included between these electrodes of the same size will be subject to the influence of the same amount of heat that is produced. If however, one electrode is much larger than the other then all these power lines will concentrate against the smaller surface, in which case we get all the electricity and all the products of the electric current concentrated in a much smaller area. It depends on the size of this smaller electrode together with the voltage and amperage, whether you produce enough heat to destroy tissue. It depends also on the character of the electrodes. If you take electrodes that are poor conductors, you don't produce much heat because great resistance is already offered up within the electrodes. If however you use electrodes that are made of metal, you will produce much more heat than if you use an electrode constructed of material that is a poor conductor because there is little resistance in the metal electrode, and all the energy of the electricity can be transformed into caloric energy.

In all surgical diathermy we use two poles but for convenience if both electrodes are of the same size, we call that the bipolar method. On the other hand if one electrode is very much larger than the other we call that the unipolar method. If we use electrodes of the same size and of a diameter small enough so that a great deal of electricity is concentrated within a small area then all the tissue between these two electrodes of the same size will be coagulated. That illustrates the bipolar method.

In order to obtain access to certain parts of the body the bladder for instance we must work in such restricted space



Above is shown a typical set of Surgical Diathermy Instruments.

that there won't be room enough to bring two electrodes to bear upon the tissues that are to be destroyed, so we use the so-called unipolar method. One electrode of very large size is placed somewhere near on the body while the other electrode of a much smaller size is used to destroy the area of the tumor that we want to destroy by concentrating all the electricity on this smaller electrode. We call the electrode that doesn't produce any heat the inert or inactive electrode while the other

electrode, which is much smaller and which concentrates all the electric energy and converts it quickly into a great amount of caloric energy, is called the active electrode

It is of course, much quicker and much easier to desiccate or coagulate a tumor if you can catch it between two active electrodes and this method is employed every time that it is desirable to get away with a large tumor in a hurry and where it is possible to apply the two electrodes so as to catch the tumor between them. It is the quickest method the more thorough method and of course preferable if you have to deal with very large or very juicy tumors

If there isn't enough room as for example in destroying cancer of the bladder or of the tonsil we use the unipolar method. It takes much longer of course to destroy a tumor with one active electrode than if we were able to catch it between two electrodes of the same size

As to choice of electrodes it doesn't make much difference in a benign tumor whether or not you insert a needle directly into it and destroy the tumor in this way. If however you have to deal with a malignant tumor the method of direct insertion of the needle will meet certain objections. For if you insert a needle-shaped electrode into the tissue you not

only produce heat, but by the sparks that are produced you have a mechanical comminuting effect consequently, there is a possibility of disseminating cancer cells into the adjacent tissue.

Again if we insert the needle at the base of such a tumor and comminute the tissue and practically start an explosion at the base of the tumor, there is also a possibility of disseminating present streptococci in the adjacent tissues. There are cases on record for instance, in malignancies of the bladder, where the insertion of a needle and the application of the high frequency current led to the development of peritonitis in a short while because from the base of this tumor streptococci were thrown into the adjacent tissue and there caused infection.

Therefore in all malignant tumors, wherever they may be located it is preferable to burn the tumor down and not to insert any electrode, because we never know what damage we are going to cause if these electric explosions occur.

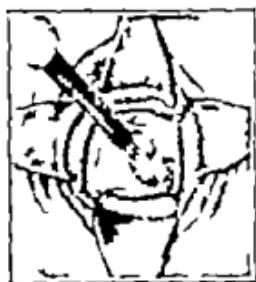
If we have to deal with a large tumor and find it desirable to remove the bulk of it, we can remove it with a so-called radio knife that is nothing else than a diathermic knife of a very low voltage. You can cut off the tumor, if you want to avoid any dissemination which may be produced by using the sharp knife and then coagulate the base of the tumor.

As to the choice of electrodes and the amount of current it is immaterial what kind of an electrode we are using for the large inactive electrode, whether we use a mesh or metal electrode provided we apply it with the proper precautions.

Any such electrode must be in the most intimate contact with the surface of the body wherever you apply it. If there is any distance between your inert electrode and the body the current will be interrupted and you know whenever you interrupt the current a spark is produced. The electric spark is not simply a shock that comes out of the electrode and enters the body if you look at such a spark with a magnifying glass you will see that the sparks travel back and forth all the time. You draw just as many sparks out of the body as you send in from the electrode. That means that any time a spark



A



B



C

A Typical Use of Surgical Diathermy

A. Bladder exposed transverse incision is placed between the two suspension sutures as indicated in the illustration.

B. Showing Carbonization of the ar-

horaceous crown of the tumor with the multi-spiked electrode.

C. Elevation of the tumor crown severing of the pedicle by means of cautery

is produced a certain damage is done. If that is kept up for a while, especially if you use a higher voltage, you will produce a regular electric burn.

In order to avoid any of these complications, if you use the metallic electrode cover the plate with soap so that even if such an interruption of the current should occur, there won't be any sparks drawn out of the body.

There is one thing that occurs quite frequently. An operator wants to destroy a tumor of the bladder let us say or he wants to destroy a tumor of the cervix or of the uterus. Quite often the inert electrode is placed on the operating table and the patient put on it figuring that the weight of the patient will be sufficient to keep this electrode in contact with the body. That is taking a long chance. The patient may move. The patient contracts a muscle and lifts the body up from the contact with this plate. It is absolutely dangerous to simply rely on the weight of the patient to maintain the contact. Any time you use an inert electrode if you are going to send enough electricity through to destroy tissue you have to bandage the electrode around the body of the patient or at least fasten the electrode with adhesive straps to the body so as to be sure not to lose the intimate contact.

It seems that mesh electrodes are preferable to the combination electrodes. If you take block tin and cover it with some gauze or sponge a part of the electrode may dry out. Then instead of a certain definite known area which carries



D



E



F

Removal of Malignancy of the Bladder

D Coagulation of tumor base and concomitant sealing of adjacent lymphatics with flat disc electrode.
E. This illustration shows how the vesical incision in the bladder is

closed by a mattress suture
F Drainage tube inserted underneath tension and suspension sutures
fascia is closed over it, and the operation is thus completed.

your electricity, you have less, which may lead to concentration of the current and to a very untoward result.

It may also happen that by a detachment of the material from the metal the contact is interrupted, and then you shoot the spark from your metal plate through the gauze, which again will injure the patient.

As to the choice of active electrodes we use the electrodes according to what we want to accomplish. The active electrode, the electrode that really coagulates, must not be too large. About the largest electrode we can use has a diameter the size of a quarter because it is impossible to produce enough current to destroy a tumor if the surface of the active electrode is too large. It would require such an enormous amount of voltage that it would not produce the results without the danger of injuring the patient.

There is one point to be considered, and that is this. If we shower sparks on the surface of a tumor, we call that desiccation.

The sparking will have a very shallow effect to begin with. In order to eliminate all the physiologic actions we reverse the current at about 1,000 000 or 2 000,000 a second. If you produce heavy sparks especially from a distance you not only interrupt your current but slow up your reversion. Consequently you produce physiological effects. These physiological effects can be so intense that a person may even die of

them, and that is especially to be borne in mind anywhere you operate in a cavity

You will see, for instance that you coagulate by intimate contact without producing any spark. Suppose you use a local anesthesia or a general anesthesia, the patient won't react at all while you have intimate contact with the tumor. If there is a distance between your active electrode and the tumor a spark jumps over and the patient will twitch. It may even go so far as to become a heart shock.

In order to devitalize the whole surface of a tumor before we go into the depths, there is one precaution to be taken and that is to use a very low amperage then you won't do much damage

As to the amount of the current, you can't lay down exact figures for surgical diathermy but that is absolutely unnecessary. You use as much current as you must. How do you find out about that? There are two ways of doing it. All your active metallic electrodes that you intend to use for electro-coagulation have to be tested empirically by yourself. It is very simple. You place a piece of meat on your inert electrode. Then you take your electrode that you want to test. While you are slowly increasing the amount of current you watch your ampere meter. Let's say you coagulate for twenty seconds or thirty seconds, and make a note of how much amperage you use. Then you cut through the coagulated area and measure the depth. Suppose this depth is five or six millimeters. You know that with this certain amperage this electrode will coagulate say five or six millimeters. Then you repeat the experiment increasing the current etc.

There are only three or four electrodes that you have to use for surgical work.

We coagulate until the tumor is absolutely dry your surface must be entirely dry. That is very important for two reasons. Quite often if you don't coagulate thoroughly your surface being entirely dry you may have a post-operative hemorrhage. When the patient recovers and the heart begins to beat strongly one of these scabs may be thrown off and there is a secondary hemorrhage. If you coagulate thoroughly until everything is dry you are sure you will not produce any implantation. If you coagulate a tumor that is full of blood vessels the scab will be absolutely black. If you

coagulate a tumor that contains very few blood vessels, the scab will be white.

It is very erroneous to try to use the maximum amount of current at the start. In diathermic procedure you have to sneak in' with your current. You begin with the least amount. It may take one minute before the current really gets hold of it, before the resistance is overcome so that you get a sufficient transformation into caloric energy. The first symptom that you get know that you have enough current turned on to coagulate, is sizzle and then come the steam and smoke. You don't turn on all your electricity right away. Don't be in a hurry. Wait for the sizzling and the steam.

The other question is when to stop. It is true enough you can test your electrodes. Still the resistances of tissues Up to recent times we have tried to overcome these difficulties in the following way. If for instance, you coagulate an epithelioma of the vagina or a cancer of the cervix or a tumor in the bladder, if the coagulation was carried too far there would be danger of too much sloughing.

Recently electricians have succeeded in manufacturing instruments which are based on the principle of the pyrometer. To measure excessive heat in a blast furnace, for instance the ordinary thermometer would not suffice at all. For special purpose there are some instruments devised based on the principle that if you solder two different metals together and change the temperature you produce a certain amount of electric current which can be measured. This principle is now applied in the manufacture of this pyrometer, so that by the introduction of the electrode you introduce this pyrometer and that shows you exactly the degree of heat that is created by your electrode in the adjacent tissues, so you have an exact



Effect of Electrocoagulation gun illustrated in a piece of beef. A distance from the 3-spiked electrode which beat has penetrated.

way of measuring. You don't have to rely on guesswork. You know exactly the heat and whether there is too much or not enough. If there isn't enough heat it doesn't mean much, because you know there is no harm done and you can increase your current. If there is too much heat you may do damage and you know it before the damage is beyond repair. Tissue that is once desiccated dies.

As to the loosening of the scab, that takes from eight to sixteen days, according to the individuality of the tissue and according to the depth of destruction. The losing of the scab is gradual. The whole scab doesn't drop off at once.

Suppose you want to sew up the bladder after you coagulate a big tumor, there is absolutely no urinary obstruction because the scab comes off piecemeal and floats out with the urine. If you coagulate near a large blood vessel be on the watch for a secondary hemorrhage. Such a patient must stay in the hospital until the healing process is finished. It is especially true if you operate in a large cavity that you may damage the wall of an artery and produce an enormous hemorrhage.

Surgical diathermy is tremendously valuable to the surgeon in two distinct ways. In the first place by using surgical diathermy we are now in a position to attack malignant tumors or other tumors that are beyond the reach of the knife either on account of their location so that the removal of such a tumor by the knife would offer insurmountable difficulties or on account of the extent of the tumor.

We don't claim (and nobody can) that we can cure malignant tumors by surgical diathermy but we can say that in a great many cases that couldn't otherwise be operated on we furnish great relief, we produce palliative results in the patient that are splendid because the patient is kept in comfort and without pain for a much longer time. Those are things that we never could have accomplished before.

The other great value of surgical diathermy is this surgical diathermy is the most important preliminary step for radiotherapy. Where this radiotherapy is executed by using a radioactive substance you all know for instance that in cancer of the tonsil or tongue the mere application of radium or the mere application of X rays quite often leads to a tremendous luxuriation of the tumors inside of two weeks they

grow out of the mouth. That will never happen if you coagulate beforehand.

PUBLISHER'S NOTE For further discussions of various phases of Surgical Diathermy, see the following

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Electrocoagulation In Surgery

By William D McFee, M.D
Boston, Mass.

(From Med Jour & Rec.)

To practice surgery successfully with the high frequency current, one must first have a satisfactory equipment there is a great deal of high frequency apparatus now in the market good bad and indifferent. In selecting the apparatus which he is to use one should make a thorough investigation and try to determine just what is best for the particular work which he intends to accomplish too much reliance should not be placed on the statements of the manufacturer or the salesman whose chief object is to effect the sale of his goods

For the purposes of electrosurgery an apparatus should be obtained which has a constant and consistent output of current, and which will produce the required quality of spark or contact heat effect. For all round purposes of electrosurgery one of the ordinary oil immersed transformers made by a reliable concern is to be preferred of these there is the large type and the small which is portable. Of the portable machines very few are reliable for heavy work such as the treatment of large, thick growths

The spark gap which regulates the quality and volume of the electrical discharge is a very important part of the apparatus it has to be cleaned and adjusted from time to time, so that some attention should be paid to this in choosing an apparatus for our use

The best results in this work particularly in those cases of inaccessible growths will be obtained by the joint efforts of the surgeon skilled in the knowledge and use of knife surgery and the surgeon having similar knowledge of and skilled in the surgical use and action of electricity To know when to do and what to do under particular circumstances with either or both of these methods requires much painstaking study and observation and much practical experience

In the operation for the removal of cancer the following technic has been successfully employed by the writer

An active electrode consisting of a surgical knife fitted in an insulated handle is used in contact with the tissue to be removed. A large indifferent metal electrode is applied to some opposing surface the patient under general anesthesia. The current used is that delivered from a good high frequency apparatus of the D Arsonval type which will deliver a high

milliamperage and remain constant in action. The current is turned on by an assistant and gradually increased until coagulation appears as shown by the cooking of the tissue. The knife, which is inserted just beyond and below the margin of the growth is then gradually moved through the circumference with a rotary motion, the growth being lifted with the other hand by means of a suture imbedded in the structure or by forceps. As it becomes separated this is continued until the growth is entirely removed. If conditions and technic are right, no bleeding should result and a clean, seared surface is assured. Very little if any pain follows, and a superficial slough occurs.

The method of electrocoagulation is adapted to a great variety of lesions and growths in many parts of the body, and my interest has been particularly attracted to the good results obtained in the treatment of a number of cases similar to the following.

CASE I.—J. S., aged eighty, was operated on by me for the removal of a papillary carcinoma, about the size and thickness of an English walnut, at the base of the tongue, according to the following technic. The patient was anesthetized with ether the head being raised and the mouth propped open with a mouthgag placed in the opposite side of mouth the tongue was held in position by a long suture passing through its center the cheek was divided by a lateral incision extending from the angle of the mouth to a point midway to the angle of the jaw thus exposing the growth which was removed by cutting it away with a knife electrode according to the method of electrocoagulation previously described. There was no bleeding as all vessels were immediately closed off by the heat from the current as the operation proceeded. The surface left after removal was gone over by the desiccation spark and the line of demarcation was well beyond the diseased tissue. The absence of bleeding makes it much easier to visualize just what is taking place in the operative field, and we are thus able to perform our work with more definite accuracy. By this method we are also more sure of destroying malignant cells which may be at some distance beyond the growth thus diminishing any tendency toward recurrence.

CASE II.—R. W., aged fifty five, was operated on by me two years ago for the removal of an extensive leucoplakia involving the cheek adjacent to the left lower jaw. This case had been previously treated by radium for one year with no result except that the disease was much aggravated the patient suffering considerable pain after each application. The radium treatment in this case was given by a physician who was skilled

in its use through many years experience. The diseased tissue was removed by electrocoagulation the indifferent metal electrode size eight by ten inches was placed under the shoulders and the surgical knife, in an insulated handle was used as the active electrode this was carried around the growth beyond its margin the growth being gradually lifted from its bed as it was separated by the current contact. Sloughs covered all the coagulated area, which is usual and these separated in about two weeks. During this time the patient was able to be about every day, had very little discomfort required no narcotics, and had no blood loss during or after the operation. Up to the present time the area treated has held its full degree of improvement.

Malignant conditions involving the mucous membranes as cancer of the tongue leucoplakia etc usually respond very little if any to treatment by X rays or radium alone but remarkable results are secured when electrocoagulation is used followed in some cases by ultra violet radiation or X ray. In coagulating tissue which is close to bony structures care should be exercised not to coagulate deeply enough to destroy the periosteum as it takes considerable time even many months in some cases for this to heal. The entire bone structure may be destroyed when necessary. Caution should also be exercised in all these treatments to see that the indifferent electrode closely approximates the skin surface it should be held in place by a bandage preferably of elastic material so that if the patient moves it is not so easily dislodged. Very severe burning may result from loose or improper electrical contact due to the arc formed in the air space between the electrode and skin good electrical contact therefore must be maintained throughout the entire operation.

Electrocoagulation if properly performed should be followed by no surgical shock no hemorrhage and no loss of blood during or after the operation. In treating growths in the mouth sometimes our coagulation will not go beyond the point of actual contact and it is well to watch these cases during the sloughing process so as to guard against possible bleeding when the slough begins to separate this however will very seldom occur. While the operation of electrocoagulation is going on if any bleeding should occur it may be immediately controlled by applying the active electrode to its source.

While the foot switch may be used by the operator to turn the current on and off it has the disadvantage of dividing his attention between his hands and feet also when using the foot switch the current strength cannot be regulated so that for

the ordinary purposes of any electrocoagulation operation the aid of a good assistant, stationed at the apparatus, who can quickly change the control switch of the transformer so that it will deliver a greater or less amount of current, changing at once when signalled by the operator, gives the most satisfactory results.

The operator may disregard any meter reading when using electrical currents to coagulate, as his best guide is his observation of the changes taking place, or in other words, the reaction in the destroyed tissue. The amount and character of current used together with the time of its application, must depend largely on his knowledge gained from previous experience.

The dissection of the growth by using the high frequency current with the spark gap in circuit and the surgical knife for the active electrode will certainly produce some most interesting results.

I believe this work has a wonderful future field of usefulness as it will no doubt be given increased attention by those in our profession who are qualified to develop its many important qualities.

(Reprinted from Fischer's Magazine)

A Further Study of Endothermy In Accessible Malignancy

By George M. Wyeth M. D
New York

It is the purpose of this paper to call attention to endothermy, a treatment of accessible malignancy which greatly reduces the danger of metastasis and the likelihood of recurrence by removing the growth as a necrotic mass instead of as a group of viable cells.

Endothermy is the production of heat in the tissues from within and embraces two procedures desiccation and coagulation. As developed by Dr William L Clark of Philadelphia this method has over a period of fifteen years proved of ever increasing value in the treatment of accessible malignancy and precancerous conditions. Sufficient time has not yet elapsed for me to use the word cured and this report is a preliminary one.

In the squamous cell variety of epithelioma and the more malignant and persistent forms of accessible cancer particularly in lesions in and about the mouth which metastasize early, are difficult of removal by the knife and are uncertain in their response to treatment endothermy is of the highest value. Lip lesions are removed under local anesthesia. Any portion of a tongue can be coagulated and immediately removed. A cancer of the floor of the mouth can be coagulated *in situ* and the necrotic mass removed in one operation. Bony structures alveolus, hard palate and portions of the lower jaw can likewise be treated and removed with the same degree of precision.

To its first great advantage of reduced likelihood of metastasis and recurrence endothermy adds another the prompt alleviation of pain. If we consider the technic of the treatment we see why this is true.

The first step in the procedure is to describe in the healthy tissue a ring of destruction around the malignant area. That is, before a malignant area is touched it is completely sur-



Fig 2.—M. t. red b. heavier current. Not des. b. f. heavy coagulation. t. h. le. I. the cent. I. aqua. el. cr. he. ed. t. red heat penel. I. he me. his por. I. is going for half a minute. 21. effect merely surface burn. I. h. rig. t. the Paqu. In. 15 b. thins cold in. he me. I. less green 1.000 ma. for h. same length f. me by touching the point of the bipolar current. \ depth of coagulation.

rounded by a wall of coagulation necrosis which shuts off and destroys the blood vessels and lymphatics to and from the affected parts. After this the malignant growth is com-



Fig. 3—Case III A. J. V., aged seventy seven, epiphysis of right ear healed after coagulation. Artificial ear made by M. O. A. Ilkens, New York, formerly of Walter Reed Hospital.

pletely destroyed *in situ* by dividing it into sections and then coagulating or desiccating each small area. Just how much current shall be used and for how long, the operator learns by experience. Conservation demands, however, that one should overtreat rather than undertreat, for a stimulating dose is worse than no dose at all.

After the lesion has been completely destroyed it is either curetted away or removed by scissors, leaving a clean base.

This base is again treated by searing over with the current to assure a further penetration by the heat and to destroy any malignant cells that may still remain.

If the work is properly done there should be no hemorrhage whatsoever. By deep penetration beyond the malignant area we render the tissues bloodless. Should by any chance a bleeding point be encountered it is easily controlled by focusing the current on it for a second or two until the heat is sufficient to stop it. Secondary hemorrhages do not often occur. However they have happened in isolated cases and were I to work in close proximity to a blood vessel like the carotid I should do a preliminary ligation. Or, it might be advisable to wait for a week or ten days after the operation when the slough begins to come away.

It is not difficult to understand that this same line of coagulation necrosis drawn about the malignant area to cut off blood vessels and lymphatics cuts off, also the sensory nerves and as the malignancy is removed the pain is alleviated. Unless the malignancy recurs there is no recurrence of pain. The value of endothermy, therefore, in that large group of so called inoperable carcinoma is very great. Though used in such cases without hope of cure it provides an alleviation

of suffering. In addition the sterilizing effect of the intense heat upon a foul discharging area is appreciated by the patient for it renders his wound less offensive. One can scarcely overestimate the importance of these features of the method.



Case IV D G aged
sixty six, squamous cell
epithelioma of the nose
healed after coagulation



F E S —
Case IV six
weeks after
operation



S it months
after opera-
tion



A t II nose by O
A. Thomas

particularly in the treatment of lesions in and about the mouth. In such cases the small remaining slough comes away in from two to three weeks and the area is completely healed within a few days thereafter. The patient can thus enjoy that early return to normal diet which is of the highest importance. Since most of these patients are markedly cachetic, anemic and badly run down their chief post-operative need is nourishment and in a florid of the mouth case I have seen the patient gain fifteen pounds within three months after operation.

Now a further word as to the nature of this method and its application. Endotherapy, the production of endogenous heat, destroys by the electrothermic processes of desiccation and coagulation diseased tissue and accessible new growths. The precancerous dermatoses including the various forms of keratoses, acanthoma benign and malignant warts, moles, chronic ulcers, papilloma, lupus vulgaris and lupus erythematosus, X-ray dermatitis and other skin lesions which may become epitheliomatous as well as epitheliomas themselves can be removed by desiccation.

Herewith are presented reports of two cases treated satisfactorily by this procedure.

Case I—C H aged sixty two had been variously treated for eighteen years for lupus vulgaris of the left face and head. The many X-ray treatments had resulted in a marked chronic X-ray dermatitis. Several months ago an epithelioma began to develop in his left cheek. Resisting treatment this had progressed until at the time patient came to my attention the wound was ulcerated and suppurating. Patient's chief com-

In the Journal A. M. A., October 6, 1918, will be found an article by Dr. Clark giving a history and analysis of one hundred cases of cancer of the oral cavity and throat. These cases were all treated by electrothermic methods or by endotherapy in combination with surgery, ray and radium.

plaint was the constant discharge of pus. Under ether narcosis the whole area was desiccated and curetted down to a clean base. Observe the good cosmetic result.

Case II—J. K., aged fifty seven was treated by desiccation for depressed epithelioma in the wing and tip of right nose. Commencing about two years ago as a scab or scale, which broke down and refused to heal, this lesion grew to be about a quarter of an inch in diameter and extended almost to the mucous membrane on the inner surface of the nose. This would have been difficult to excise but it was desiccated under local anesthesia and the photograph shows how satisfactorily Nature filled in the depression, a result we could not have expected.

Fig. 6.—Case I. C. H., aged sixty two, epithelioma arising in healed lupus vulgaris healed after desiccation.

had X ray or radium been employed. After lesion had healed patient was given a prophylactic dose of X rays.

With the monopolar current, a current of high voltage and low amperage from an Oudin resonator of a high frequency machine we cause a dehydration or drying up of the tissues. This treatment is applied with an ordinary sewing needle held in a suitable handle. With the newer machines it has the decided advantage of being subject to a fineness of control which allows one to apply the heat where he will and to what degree he will in all accessible lesions. So delicate is the adjustment it can be throttled down practically to a pinpoint area permitting one to work in the cornea of the eye or on the vocal cords.

The method is ideal for removing these small tumors of the eyelid which may be removed at their base without destroying much of the surrounding tissue. It does away with the contracted scar and consequent ectropion. Vernal catarrh responds to the brushing over of this current, as does leukoplakia. Desiccation is more or less painful and is done under local anesthesia.

Coagulation the other form of endothermy, where the heavier and more powerful currents are used, require general anesthesia. Chloroform or ether may be given but if the latter it must be removed from the room when the current is in actual use.

By means of the D Arsonval or bipolar current, one of low voltage and high amperage, lesions of larger size and greater depth are given the more intense penetrating action of this endogenous heat. The result is coagulation. The heat is sup-

plied by connecting one pole of the machine to a well wet indifferent electrode under the patient's buttocks as he lies upon the table. The other pole, the active electrode, is attached to handle in which is an ordinary steel darning needle. With this in hand any amount of coagulation necrosis can be described at will. Large areas on the surface may be destroyed, or smaller or larger lesions can be penetrated to any depth or coagulated through their entire thickness.

The following cases were both satisfactorily treated by coagulation.

Case III—A. J. V., aged seventy-seven. Eight years ago following a scratch from a blackberry briar a small scab appeared on the patient's right ear. His physician cauterized it and in the years that followed the lesion was variously treated by salves, pastes, scrapings and X rays. When the patient came under my care almost the entire outer ear had been destroyed except at the superior angle. It was a foul ulcerating suppurating cavity with considerable pus discharging from the external auditory meatus. Pressure anteriorly also caused pus to exude. The patient was much debilitated, was a chronic nephritic with a blood pressure of 220. I was therefore loath to anesthetize him and referred him to one of our largest cancer institutions for radium treatment. When this was refused with the full consent of the family who knew the patient was a bad operative risk under ether narcosis the wound was thoroughly coagulated and curetted. Observe lesion completely healed.

Case IV—D. G. aged sixty six reported that about three months ago he noticed a small sore on the left side of his nose which rapidly increased in size. His physician applied salves and lotions and finally sent him to a hospital where he had five X ray treatments. The lesion grew and became painful. The Wassermann was negative. Under complete anesthesia the lesion was coagulated and excised. Photographs indicate the progressive course of Nature's filling in process after the operation.

Coagulation by endothermy differs from other methods of cauterization by heat in that the active electrode is cold when applied. Heat comes from within as contact is made with the electrically heated tissues. It is therefore progressively penetrating according to the amount of current and the length of



FIG. 7.—Case II. J. R., aged fifty seven, depressed epitheloma in wing of nose; healed after desiccation.

time applied. This is in contradistinction to heat applied from outside as with the Paquelin cautery, the Percy cautery or fulguration as advocated by deKeating Hart.

Endotherapy neither burns nor chars. It can be executed through a piece of paper, but I would take this opportunity to warn against its indiscriminate use. Irreparable harm may result from lack of technic.

It would appear that cases of inoperable cancer are on the decrease partly for the reason that precancerous conditions are today, more promptly than ever before, recognized by both laity and practitioner, as possible malignancy. Another encouraging sign is the recognition by cancer specialists of the fact that no one method can successfully be employed against malignancy surveying the field in general, the progressive surgeon appreciates the value of radium, the X ray, and endotherapy. He again and again meets certain malignant conditions which yield to other methods more satisfactorily than to the knife.

May not sufferers from cancer confidently expect, therefore, that those charged with their care will study all the aids which are now available, suiting the treatment to the nature of malignancy?

CONCLUSIONS

We have learned to enumerate the advantages of endotherapy as follows:

- 1 Decreased danger of metastasis and likelihood of recurrence
- 2 Alleviation of pain
- 3 Practically no hemorrhage
- 4 Practically no surgical shock
- 5 Accuracy of dosage current under absolute control of operator
- 6 Sterilization of wound incidental to treatment
- 7 Patient's postoperative condition generally satisfactory leading to quick recovery and good cosmetic result.

My thanks are due Dr George C Andrews for taking the clinical photographs

(Reprinted from *Tucker's Magazine*)

have always found that the chief difficulty was that we were able to make so little impression on a massive tumor at one sitting even though we attacked the pedicle. Fulguration seems to yield its best results in sparkling out superficial flat areas of disease where the papillary tumor is disseminated. In papillary carcinomata with infiltration, it is of course worse than useless. It is not our desire, however, to deprecate an agent which in a limited field has proven such an advance over previous ineffective methods.

More recently, an effective apparatus has been devised by Edward V. Clark of Philadelphia and extensively utilized by his former co-adjutor, Dr. George A. Wyeth of New York, who has brought this machine to a remarkable perfection. Wyeth, who is also a first class surgeon, as well as urologist has made use of the desiccation and endothermic method to destroy tumors in the bladder by making a suprapubic opening and then penetrating and desiccating the disease in an area all around the base of the tumor which is then undermined, desiccated, and removed. The method is not applicable where there is basal infiltration but only to the papillary carcinomata not yet become invasive and to simple papillomata.

The writers believe that this method affords an extraordinary facility, for dealing with these tumors without an incision, through the open cystoscope, in the male as well as in the female, and that in this way it will be possible to desiccate the bases of all pedunculate tumors and destroy them as a rule at a single sitting. Such a procedure simply calls for dexterity in the use of a cystoscope and in introducing a long well insulated needle to be brought into contact with the base of the tumor or to be plunged into it. This will cut out the use of radium in all but the infiltrating metastatic, or superficially widespread types, a welcome retrenchment in the radium field. In recapitulation, the method which has the widest field of utility is the use of radium, and we have here an agent whose value is not yet fully appreciated in dealing with those otherwise hopeless cases. The endothermic method however greatly simplifies and extends and helps the radium application in removing masses of disease and curing the patient quickly in the simpler cases, and in limiting the field for radium to those in which the bladder wall is invaded.

(Reprinted from Fischer's Magazine)

Surgical Diathermy in the Treatment of Benign Skin Blemishes

By Albert F. Tyler M. D
Omaha

The removal of benign skin blemishes is essentially a destructive process. Since these conditions are most frequently found about the face a method which will destroy the blemish and at the same time allow healing to take place with the minimum of scar formation is highly desirable. Daily use of Surgical Diathermy has convinced the author that this agent is the one fulfilling all requirements to the greatest degree.

The advantages of Surgical Diathermy in the treatment of benign skin blemishes may be stated briefly as follows:

1. Ease of Application—The patient coming for treatment of a benign skin blemish usually seeks treatment hoping thereby to improve her appearance. She is naturally apprehensive about it all and is greatly pleased if the treatment is such as to inspire confidence. Surgical Diathermy can be applied so quickly and with so little fuss that the patient at once feels at ease. In the smaller blemishes the current can be reduced to such a small amount that the noise of the spark gap, even where the open type is used is scarcely noticeable.

2. Perfect Control—Where the blemish is small the current can be reduced easily to the minimum and where a larger amount of tissue is involved requiring deeper penetration the current can quickly be adjusted to suit. The changes are instantaneous. The effect of the treatment on the tissue is visible while the treatment is being applied making the physician certain about his results.

3. Inconspicuous—Small blemishes on the face which are annoying to the patient should be removed with as little disturbance as possible. Where surgical diathermy is properly employed the lesion is no more noticeable when the patient leaves the office after treatment than when she entered the office before treatment. In fact in many instances the blemish is much less noticeable after treatment. Little or no swelling occurs afterward which is in strong contrast to some methods.

4. Bloodless—Surgical diathermy is a bloodless method. The



FIG. 1. Sebaceous cyst removed from the lower eyelid near the margin. Successfully removed by surgical diathermy.



FIG. 2. Same patient in Figure 1 after treatment.

If one is to get the greatest service from it he must choose the cases in which to use it. I have found it valuable in the following conditions

- | | |
|-------------------|------------------------------|
| 1 Moles | 7 Angiomas (small) |
| 2 Warts | 8 Telangiectases |
| 3 Papillomas | 9 Tattoo Marks |
| 4 Corns | 10 Boils |
| 5 Sebaceous Cysts | 11 Localized Skin Infections |
| 6 Spider Nevus | |

Technique

The following technique has proven satisfactory

Sponge with Alcohol The skin is carefully and thoroughly sponged with alcohol

Make Skin Dry All excess is removed and the skin made perfectly dry If alcohol remains on the skin at the time the current is applied, a flame occurs causing a disagreeable burn of the skin or even disastrous injury to the eyes or hair There must be no water on the parts at the time the current is applied

tissues are dehydrated, assuming a grayish color after treatment which can easily be concealed by the use of cosmetics during the healing process

5 Local Anesthesia—Local anesthesia should be used as a routine in order that the patient may not feel the burning during the application of the current and that she may hold immovable during the operation so that the greatest accuracy may prevail in the application of the current. This is important since the least possible amount of tissue should be removed.

6 Small Soft Scar—When proper technique has been employed in the application of surgical diathermy the resulting scar is small, soft, pliable and practically the same color as the untreated skin surrounding it With this end result the casual observer will not notice it.

Cases Suitable

Surgical diathermy is not a cure all.

since this dissipates the heat and does not allow accurate control of the effects of the treatment.

Local Anesthetic After the completion of the two steps above inject sufficient novocain adrenalin solution to produce complete anesthesia. 5 per cent solution of novocain is easily prepared is not toxic and produces perfect anesthesia. Those who desire may prepare the solution fresh each time by using the dental outfit consisting of a small graduated metal or porcelain container for the distilled water supported by a wire handle. The water is boiled over an alcohol lamp or a gas burner after which the prepared tablet is dissolved in the water. The anesthetic solution can then be drawn into a sterile hypodermic syringe or a sterile dental syringe and is ready for use. Where the lesion is small the needle can usually be inserted at one point near the margin of the blemish enough solution being injected to blanch the affected skin. Where the lesion is larger the needle can be removed and reinserted near the margin but still within the blanched area. This process may be repeated until sufficient area has been covered to render the entire lesion anesthetic. By following the above technique the first insertion of the needle is the only one producing pain. Sufficient time should be allowed for complete anesthesia to take place before beginning actual application of the current. The time will vary from one to ten minutes, depending on the size and location of the lesion. When complete anesthesia has been obtained dry the skin carefully again.

Monopolar Method. Where the lesion is small the monopolar method of application may be used. The cable to which the applicator is attached should be connected to the Oudin binding post which is marked on the machine or is indicated in diagrams accompanying the machine. When the monopolar method is used in this manner the current passes from the machine to the patient and thence to the ground.



Fig. 3. Photograph showing small angoma in the lower lip successfully removed by surgical diathermy.



Fig. 4. Multiple warts on palms of both hands. Successfully removed by surgical diathermy.

Some have advocated having the patient hold the electrode in the hand while the physician holds the uninsulated needle applicator in his hand. The physician then brings the applicator to the lesion taking the current away from the patient. When the monopolar method is used in this manner the current passes from the machine to the patient thence through the physician to the ground.

Bipolar Method When the physician wishes to employ the bipolar method or D'Arsonval current, an inactive electrode is connected by cable to one binding post while the applicator or active electrode is connected to the other binding post. The large inactive electrode may be held in the patient's hand, or placed in contact with the bare skin of some other part. When working the active electrode is brought in contact with the lesion being treated and the current then passes from one electrode through the patient's body and out the other electrode.

While speaking on this subject at a medical meeting recently, a physician asked "Which is the positive pole when using the bipolar method of application?" The discussion which followed called forth the information that in surgical diathermy the current has no polarity. That is, a high voltage alternating type of current is used, the polarity rapidly switching back and forth from positive to negative. This alternating current is then alternated and interrupted so rapidly that the muscles do not have time to contract. The tissues are poor electrical conductors, hence when the current is forced through them they become warm. There is just as much current passing through one electrode as through the other. When one electrode is large the current is distributed over the entire surface and only a small degree of warmth is produced. On the other hand, when the electrode is small like the point of a needle, the same amount of current is forced through a small point of tissue and intense heat is produced. The large electrode is thus styled the "inactive electrode" while the pointed electrode is styled the "active electrode". Neither electrode can be called positive or negative when high frequency current is employed as in surgical diathermy.

Sparking When the lesion is small and very superficial the needle like electrode should be held about one millimeter away from the skin allowing the current to spark across from the electrode to the lesion. By moving the electrode about, the entire surface of the lesion may be equally affected, avoiding

the danger of leaving pits where deeper destruction was made than in others Fig 5

Insertion of Needle Where the lesions involve the deeper layer of the skin, as in warts it is preferable to push the needle into the tissue at one point at the base, turn on the current and hold it there until the tissue turns gray then turn off the current remove the electrode and reinsert it a short distance away, repeating this process until the entire base of the wart has been coagulated. Fig 6

The same technique is applicable in removing tattoo marks since the pigment rests in the deep layers of the skin. Where a large area must be removed, skin graft will be very helpful in saving time and in minimizing scar

Large angiomas are better treated by radium and should not be attacked by diathermy So much destruction is disfiguring and is unnecessary and impractical

After Care

Following the application of surgical diathermy to a skin blemish the patient should come in for observation at least every other day For the small lesions, no dressing is necessary and the patient may bathe the face as usual In some instances a slight exudate occurs under the coagulated tissue which causes pain by pressure and should be released when found. If the exudate is not released it will become purulent in character and delay recovery

Where a large surface that is more than 5 cm. in diameter is treated repair will be greatly aided and much time saved by exposing the lesion and the surrounding skin to radiant heat fifteen to thirty minutes daily followed by massage. The heat and massage increase the circulation and promote the formation of a soft, pliable, movable scar



Fig 5 Drawing showing the needle applicator held short distance way from the base, shower of sparks passing to the lesion.



Fig 6 Needle applicator inserted into lesion. Multiple pencils such as this are used until entire base is coagulated.

Electro-Surgical Removal of Piles

By W B Chapman, M.D.

Carthage, Mo

Hemorrhoids or piles may be classified according to their location, appearance, cause character, or the symptoms that they produce. To the surgeon, however, the only question of importance is their safe and effective removal.

During the past three years I have performed quite a number of hemorrhoidal operations by surgical diathermy or electro-coagulation, and the success that has been attained convinces me that in the majority of cases this is the operation of choice.

The technic is simple and is as follows:

Cleanse the field and paint over with Tincture of Iodine. If the hemorrhoid is inside the rectum, it may be exposed in a woman by inserting a finger inside the vagina and exerting pressure on the rectum. If a man, the cup and suction apparatus of the high frequency machine is quite effective. When the pile is exposed, grasp it with the thumb forceps (Fig. 1) and, using a 2 per cent novocain adrenalin solution inject a few drops underneath the tumor (Fig. 2). The thumb forceps should be rubber tipped to prevent pinching. I usually cut short lengths from an old rubber catheter and slip over the ends of an ordinary tissue forceps.

For the operating instrument a sharpened Plank needle is very good. Any kind of a needle will do, but I employ the short pointed electrode that comes with the Diathermy oper-



FIG. 1.

ating set. This becomes the active electrode of the D Arson val circuit while for the indifferent electrode I employ a large piece of block tin which is warmed and held in place by sand bags. No soap lather is required for contact and it makes little difference where it is applied. It is also possible to use the autocondensation pad or handle as the indifferent electrode but requires much more current and the results are not so uniformly satisfactory.

Using a high frequency machine at the lowest tension set the controls so that the meter will read about two thousand milliamperes when the two electrodes are brought into contact with each other. With the current adjusted the tumor anesthetized and the indifferent electrode in place, insert the point of the operating needle into the pile and using the foot switch apply the current until the pile turns a steel grayish color (Fig. 3). This only requires a few seconds. The injection solution inside the pile becomes boiling hot and by scalding destroys the endothelial lining of the dilated blood vessel causing a coagulation and consequent disappearance of the tumor by absorption.

Hemorrhoidal tabs or sentinel piles are largely fibrous tissue and should be coagulated until white. They separate after about ten days and the base heals over with a soft, pliable scar. After coagulation, the hemorrhoids will protrude from the rectum and should be bathed twice daily or oftener with hot boric or cresol solution. This limits the swelling, prevents infection and relieves pain and soreness. If there is much after pain prescribe a suppository of cocoa butter containing one grain of opium and from $\frac{1}{2}$ to 2 grains of belladonna. These suppositories are on the market and can



FIG. 2

be secured from any druggist on prescription. Instruct the patient to insert one suppository into the rectum on retiring, and they may be used as often as is required to ease pain. An ointment containing morphine sulphate gr. 5, tannic acid gr. 10 in one ounce of zinc oxide is also useful.

By the above procedure it is possible to treat successfully any case of piles and the patient may proceed about his daily work. It is best to coagulate only one tumor each time, the patient returning for another treatment, as soon as the soreness from the last is gone. The unfortunate thing about the treatment of hemorrhoids by surgical diathermy is that especially inexperienced operators, will overtreat and produce so much tissue destruction at one time that the patient is completely incapacitated for several days. Three or four treatments usually suffice to clean up even severe cases as the coagulation of one tumor often impairs the blood supply to several other hemorrhoids, causing them to disappear also. I have in mind a case where one treatment cured a case of hemorrhoids that was so bad that the man was incapacitated from earning a livelihood and was confined to his bed a large portion of the time. Another thing with this operation there is not the danger of hemorrhage, embolism or infection that attends the old operative procedures, and the end results are more satisfactory.

(Reprinted from *Fischer's Magazine*)



Fig. 2.

Electrocoagulation of Tonsils

By R. F. Elmer M. D

In the method that we use in taking out tonsils we are competing with the men who remove tonsils with a snare or a guillotine. We have attempted to remove and think we have succeeded in removing the entire tonsil at one sitting. First of all we must consider the anesthesia. True enough the big bug bear of taking out tonsils with dia thermic is edema of the throat and with that edema of course, the pain and the difficulty of swallowing. Some individuals in our first cases had to be given morphine, and at one time we thought we would have to do a tracheotomy. That was about a year ago and we have a record now of 325 cases in a year where we have taken out the entire tonsil.

In about the first 90 cases we did with this method those individuals could have their tonsils taken out again because we just got the tops of them. The reason for that was that we went in with a great deal of current. We don't use that much current in taking a tonsil out in toto.

First of all we place our patient in a chair like this. We do all of our work by daylight. I can't tell you much about the physics. The only thing I want to tell you about is the technique we use, and a few results of the number of cases that we have. The patient holds the large electrode. I have used a number of needles, but with this type of needle you can get down into the tonsil and if it is loose you can manipulate the tonsil anyway at all you can bring it right out providing you haven't a number of adhesions. As a rule from an inflammation you don't get many adhesions that you have to worry about. If you do have some you can dislodge them with a little traction. The adhesions that trouble you are those from different incisions from a prior quinsy or something like that.

As to the anesthesia, we use one-half to three-quarters of one per cent solution of novocain or procain. To that we add five grains of magnesium sulphate and five grains of sodium chloride to each ounce of solution. There is a purpose for that. There is a surgeon in New York

by the name of Beers who does a great deal of bladder fulguration. About a year ago I heard him talk about this method and it didn't seem plausible. He stated that he gave a patient a quarter of a grain of morphin diluted in a 25% solution of magnesium sulphate and the narcosis in that individual lasted from eight to fifteen hours. If you are going to use that, if you take an individual with a gall-stone colic or an infected knee joint or some condition of that kind, and give him an eighth of a grain of morphin in a 25% solution of magnesium sulphate, you will never hear from him for ten or twelve hours. He goes to sleep and stays there. The idea of putting the magnesium sulphate in there is to prolong that analgesic action until the acute reaction of this has passed over, and that takes three or four hours.

Eight minutes is the average of 325 cases. They walk out of our office, have no more pain, go home and have their dinner. We advise them to stay off the next day. Very few cases have stayed off more than two or three days. I believe it is due to that magnesium sulphate.

Edema is the greatest element here. If you can get away from that edema you can do anything with the throat with coagulation. If you are coagulating a large carcinoma at the base of the tongue you want a lot of current, you want penetration but you don't want marked penetration in the tonsil because you can run the needle any place you want in the tonsil. You can manipulate it around like I can manipulate my leg around. The tonsil is not bound down. You have taken out tonsils with snares you have got hold of them with the tenaculum and you have pulled them all the way out and put the snare around them and have got them all out without dissecting them around. You can do the same thing with this.

We were getting a great deal of edema. We were trying to get away from it. We thought possibly that the traumatizing of the anterior pillar was doing it. It was doing it. We found out in this way. We took three young men between twenty-one and twenty-four years of age. We will say this is the uvula and the posterior pillar and this is the anterior pillar and we mark this the tonsil. See the wide spread there. At first when we were anesthetizing our

tonsil, we thought we had to go along here. We worked on the method of coagulating a carcinoma. We plunged the needle through the anterior pillar into the tonsil at point No 1. Then we came down to point No 2 and went through again into the tonsil then at point No 3 the lower pole, we went in again, and that is all we did to those three boys. We told them to come back the next day. When they came back they had just as much edema as in the cases preceding in which we had done an electrocoagulation.

Now for the anesthesia, we use it just a little differently. We leave this pillar alone we don't touch it at all. That is dynamite. We try to keep away from it as much as we can. We go in here with that little forceps between the tonsil and the posterior pillar. We call it pole No 1 pole No 2 and No 3. We inject the solution that I mention right between the tonsil and the palatoglossus muscle and of course that brings the tonsil out a little bit. Then we do the same thing at No 3 and the same thing at No 2.

For the anterior pillar and the top of the tonsil we take a two per cent solution of cocaine on a swab. We start on top over the entire anterior pillar and over the entire tonsil and up to about this point on the uvula. If the individual wants to gag a lot like the boy we had here we swab that entire throat. We get a paralysis of the entire mucous membrane of the pharynx and the throat, and that individual will not gag any more because the method only takes eight minutes (you can possibly do it faster) and in eight minutes you have the individual up again. By not swabbing them and keeping them gagging you might keep them there for a half hour.

We have swabbed this with a two per cent solution of cocaine. We have injected three poles, and we are ready to go along and coagulate the tonsil.

It is not absolutely necessary to have this anesthesia. I have seen doctors go through it without anything at all and they have coagulated the tonsil.

Another thing we have tried which I think is just as good as cocaine is a five per cent solution of magnesium sulphate. We have also tried sterile water under pressure, and get better results with the sterile water under pressure than we do with the novocaine.

The machine I have hasn't this spark gap on it, and I know just how far to pull mine out. It has another gap with a rod on it. I pull it out four ways. They have to tell you how to regulate the machine. This meter shows when my needle is in the tonsil it registers 400.

When we first started out, I said we had lots of trouble with this. Nobody seemed to be doing it around town and we got the machine and wanted to coagulate some tonsils so we started. We have had a pretty rough road up until the last 150 cases that we have done, and we have had great results with the last 150 cases. I don't ask you to adopt this method of taking out tonsils. You can try it just once, anyway. Get a nervous woman who won't go to a hospital who won't take an anesthetic, and try it on her. She will complain about the least little ache or pain she has got. After that you will be convinced that the method is a good logical ideal way of taking out tonsils in adults.

In children we don't attempt it at all. The youngest child we had was nine years old. He had a patent foramen ovale. He was cyanotic when he was brought into the office. He was the only one I ever saw that had reached the age of nine years. A doctor brought him in to us. We took out his tonsils under this magnesium sulphate anesthesia. I don't think any one would have tried to take out his tonsils under ether or would have injected any novocain or anything like that.

In heart lesions chronic interstitial nephritis, or any marked constitutional disease, the method is an ideal way of taking out tonsils.

The way we learned to take out these tonsils in this way was to take a piece of beefsteak an inch thick put the beefsteak on some other individual's hand, and run the needle through the beefsteak until we reached the person's hand. There is a feeling or sensitiveness of resistance. It is a peculiar resistive tonicity that you feel back there. That is the thing you are looking for.

When you go into that tonsil start right in the center of the pole. We know that we get a part of the tonsil coagulated anyhow. We go right in the center until we feel that resistive tonicity in the needle.

Then we turn on our machine put the switch down until we see a slight discoloration around the needle about the size of a split pea. That is about all we want in there. We don't want it to smoke and fume. Then is when we get our edema and our trouble. You need only 400 milliamperes there, and if you get over that you get trouble.

Follow the tonsil the same way all the way around. You don't move that tonsil one way or the other you let it lay where it is. After you have coagulated it is hard and indurated you couldn't put a needle through that spot again if you wanted. After you have coagulated that surface, you can go in here between the anterior pillar and the tonsil and you can pull the tonsil way out and go through again and coagulate again. I usually coagulate from twelve to fifteen spots on a tonsil depending on how big the tonsil is.

The main thing is that resistive force. You don't get through too far. You can't go all the way through into the throat.

In a submerged tonsil where the anterior pillar comes over and you can just see a small tonsil instead of going in with a lot of instrumentation and pulling this pillar up and that one down and taking a tenaculum and pulling the tonsil over we inject about twice as much at pole No 2 and balloon the tonsil up parallel to the anterior and the posterior pillars. If you don't think it is up far enough take some sterile water and put some more in there it will balloon out more. We do the same thing at pole No 1 and pole No 2. These pillars turn back and you have the entire tonsil in front of you. I would rather take out a submerged tonsil than any other type of tonsil.

A type of tonsil that we don't take out at all is a large tonsil, about the size of a crabapple that obstructs the entire posterior portion of the mouth and the entire pharynx. We don't take them out with this method because we feel we have too much coagulation to do and we get edema. The individual is better off by far if we go in there and snare it or use the guillotine.

As to the complications that have arisen in our series of cases, one is Vincent's angina. The tonsil is a great habitat for the Spirillum of Vincent. In two of our cases on

the second day the slough started to leave the tonsil and go over on the uvula and over on the soft palate. We felt we were going to lose that patient from simple tonsillectomy but we injected with salvarsan, 6 each day for three days. That is quite a dosage, but the slough cleared up and the throat healed up and if you didn't know that the man had his tonsils coagulated you wouldn't note the deformity that is in the roof of the mouth there.

Another contraindication for taking out the tonsils is an acute syphilis.

In this method you should not see a drop of blood. We have a record of only one case of secondary hemorrhage. That was in our first series, and I think we used too much current and too much penetration.

The advantages of the method I believe, are that we abolish hemorrhage, we abolish the secondary post-operative pneumonias, especially the aspiratory form of pneumonia, and I think with this method you don't excite a latent tuberculosis of the lung as you do with the snare method. You don't have to incapacitate the man for work more than a day or two or at the most three days. The method is ideal. You don't have to be afraid to go in and coagulate the tonsil because it doesn't do any harm as long as you stay away from the anterior pillar.

If you should get a reaction in there and should have a sore throat, if you should get some edema, the best thing to use is a saturated solution of magnesium sulphate for a gargle or a two per cent solution of antipyrin. We also use on the neck hot fomentations of a saturated solution of magnesium sulphate.

Electro-Coagulation of Tonsils



Close up of throat



*The Electrodes and
holder*



The foot switch

Sinusoidal Currents in Gastro-Intestinal Stasis

By Lloyd M. Otis, M. D

In the past the chronically constipated individual and dyspeptic, with the exception of the gastric ulcer case, has been looked upon by the medical profession as a bugbear. Outside of diets and greasing his canal not much has been offered him and his troubles have been rather lightly looked upon.

Today the medical man realizes more than ever the ultimate damage done by a chronic toxæmia. Focal infections as hidden etiologies of a vast number of conditions have been much in the limelight.

In the past it has been a convenient term for a physician to pass off a diagnosis of some form of neurosis in order to cover up his inability to properly analyze the conditions present. We now realize that the nervous system is amongst the first parts of our anatomy to succumb to the reabsorbed toxins from a sluggish gastro-intestinal canal. As soon as the nerve force is lowered there is as a result an impaired gastro-intestinal musculature. From here our complex begins. We do not always have a clear cut symptomatology of toxæmia. Many of these patients present themselves with a vague set of symptoms that point to all other sources rather than the etiological condition. They may present themselves with a vague set of pains, or isolated pain about a joint, especially have I seen these patients come complaining of pains about their shoulders. Frequently they are unable to sleep well. Their nervous systems are deranged anywhere from a mild nervousness to the point of melancholy or insanity. The average case, however complains of headaches, dizziness, lassitude, nausea or vomiting and weakness.

The etiology of our gastro intestinal stasis is in a large proportion of cases due to the American Speed. We are living faster than our anatomy can adapt itself to its environment.

It is an easy matter for us to neglect the bowels at their own call and take a pink pill in the evening. Soon the normal food stimulus is too mild to produce the required peristaltic action and catharsis becomes the habit. As time goes on massive doses are required until finally the enema life is begun. Here we arrive at the same place as the hypertrophied prostate with retention of waste products in the bowel while he is retaining the waste products from his kidneys in his bladder.

While I believe the profession will agree with me that this is the most frequent cause or at least is the etiology of a vast majority yet we still have a few legitimate causes producing the intestinal type of stasis. The condition is three times as common in women as in men because pregnancy and modes of dress lower the tone of the abdominal musculature.

Adhesive bands acute angulations, reflex conditions and prolonged weakening diseases also enter into the causative factors.

While the above conditions produce both intestinal and gastric stasis and atony yet there is one etiological factor in producing the large gastric dilatation where physiotherapy has an important role in correction and that is the resulting gastric dilatation after narrowing the duodenal outlet, in healed duodenal ulcers. The stomach here is like the hypertrophied heart. It may hypertrophy and deal with the lesion for a while but at times its compensation breaks. If the ulcer scar has not contracted to the point of complete obstruction prior to consulting the physiotherapist his chances are that he will not need surgical intervention.

THERAPY

I feel that a large percent of physicians are off on a tangent when gastro-intestinal toxemias are treated on the intestinal flora basis. I think the day of treating symptoms and not the cause has passed. I feel it is but common sense that if a man has a stagnant gastro-intestinal tract he can not help but have an increase of intestinal flora. The treatment of the flora will not remove the cause. Yet I do not feel the patient should be treated in spots and the in-

testinal tract be given all the consideration. Most of these patients are low in hemoglobin, and their kidneys have been trying to do double duty. The urine is heavily laden with indican and generally gives a high urea test.

I give the patients quartz to build up their blood and assist in their general reconstruction. Auto condensation is given to remove the venous congestion of the abdominal contents and assist in giving them a better circulation. At first they are given diuretics and some petrolagar which are gradually withdrawn as the sine current gets under way. They are given a diet and I insist upon the drinking of water freely. Sinusoidal treatments are given twice daily for from 2 to 3 weeks at which time the cases generally leave the hospital and then 3 times weekly down to once a week until discharged.

FLUOROSCOPIC OBSERVATIONS OF THE SINE WAVE

A number of cases were selected that previously X ray had shown were cases of hypomotility and gastric dilatation with retention of from 8 hours to 12 and 15 hours. Most of these stomachs were ptosed. When the barium meal was given the fluoroscope showed stomach with scarcely any visible peristalsis. Massage failed to stir them. Two pads were placed under each shoulder blade and connected to the Morse Machine. Immediately after turning on the current active peristaltic waves were seen starting at the cardiac end of the greater curvature. The waves are deep and indicate a strong muscular contraction.

Cole of N Y has shown with motion pictures of normal stomachs that it requires 4 peristaltic waves to fill the duodenal cap. Under the influence of sinusoidal current I have seen them fill in 2 waves and scarcely ever over 3. This alone speaks of its value.

That gastric retentions are remedied may be shown by the following. Using the aforementioned cases that were emptying in from 8 to 15 hours, when these cases are given a barium meal and then sinusoidal treatment started they are found empty in from 2 to 3½ hours. All the above cases were found to be emptying in from 5 to 6 hours, after from 2 to 8 weeks daily treatment.

Fluoroscopic examinations made during the administration of barium enemas before the use of the sine current and after its use are very interesting. The colon is filled and the peristaltic action noted then the sine current turned on. The following observations are made. The contractions are deeper more frequent and the barium column is sent along in spurts. Barium that prior to using the sine current showed a pause or a failure to pass the flexures now readily passes through.

CASE HISTORIES

Case No 1—A lady patient, aged 54 entered the hospital her chief complaint being dizziness, vomiting and constipation. These symptoms had been present for 7 years. In the last 15 months she seldom missed a day without vomiting. The dizziness was such that she could scarcely walk without the assistance of another person. Examination revealed the following. The patient rather poorly nourished skin of a yellowish tint. Chest negative. Abdomen tympanitic and tender. Blood pressure 150-84. Hemoglobin 70 Urine examination. Rather heavy indican test, 35 grams urea per 24 hours

X ray the barium meal upon entering stomach passes directly to the antrum. Stomach fills readily no irregularities in outline greater curvature at pelvic brim, very few peristaltic waves. Duodenal cap normal. 8 hours there is about one-third of the barium remaining in stomach. Head of barium column is seen in transverse colon in 12 hours the column is seen at the splenic flexure, but has not passed beyond in 24 hours the barium is through the colon. The colon is dilated throughout but especially in the ascending and transverse portions. Peristalsis very sluggish. The following day a barium enema was given. About 2½ pints were given before it left the rectum, then it slowly traversed the descending colon to the splenic flexure where it refused to go farther. Another quart was given but the barium column did not advance. A diagnosis was made of auto intoxication due to atonic stomach and retention and atonic colon with partial obstruction at the splenic flexure.

This case was given daily sine treatments together with auto condensation and general quartz ray. A check up on the 5th day with the barium enema the food was passing

slowly around the splenic flexure. On the 9th day a barium enema was given with the same findings. A sine treatment was given and the barium was then seen throughout the colon. The stomach check up on the 14th day showed only a small trace of barium after 5 hours. The nausea and vomiting ceased after the 4th day. The dizziness disappeared on the 5th day. Patient left the hospital on the 18th day feeling in the best health she had had for 7 years. The indican was gone from urine. Hemoglobin 87%. Bowels functioning normally. Patient to continue treatments twice weekly for about 8 weeks.

Case No 2—A woman aged 43 came to me in September 1918. She had complained of gastric disturbance from time to time since a girl. Her present history as follows. A dull pain located in lower abdomen. At times, however, the pains are sharp. They seldom radiate, but at times are referred to the back between the shoulders. They are relieved by belching. There is always the sensation of a weight as if something was dragging in the lower abdomen. Constantly regurgitates. Vomits many times. The vomitus is never bloody or coffee colored. In general she sleeps well has a good appetite, is weak and always constive.

X ray examination Food upon entering stomach drops to bottom none held back in fundus. Stomach found in bottom of pelvis. No deformity in outline. No peristaltic action. Duodenal cap regular in outline. 14 hours retention. Diagnosis. Atony and extreme gastropostis

Treatment She was given ten minutes sinusoidal treatments B L D for two weeks then at intervals for a month. Was kept on Lenhardt diet. At the end of the first week the pain regurgitation vomiting and weight like sensation were gone. At the end of the 2nd week her strength was much improved and she was discharged from hospital.

She was seen in January 1924 and has been entirely free of stomach symptoms since her treatment. X ray at this time showed a fairly active peristalsis. The greater curvature is 1 in below the crest of the ilium. Stomach found empty at 6th hour after barium meal in contrast to a previous 14 hour retention

Case No 3—A single lady aged 34 years, bookkeeper

Came to me saying that her memory was failing and her inaccuracy in her work was giving her much concern. She suffered a great deal with headaches and was compelled to be at home on an average a day a week and at times was unable to be at work for 2 or 3 days. She also had a dull non radiating pain in the upper right quadrant of the abdomen. This pain she was scarcely ever free from. Slight dizziness general lassitude loss of appetite and strength was beginning to make her work almost impossible. She had not had a normal bowel action in 5 years and was resorting to enemas.

Examination The patient, an average built woman poorly nourished. Skin yellowish brown. Chest negative. Abdomen tympanitic and very tender in upper right quadrant. Considerable rigidity of the muscles over this area. Urine negative except a gravity of 1034 and a heavy indican test.

X ray findings Stomach fills readily. Greater curvature 3 inches below crest, stomach regular in outline but greatly dilated. Very little peristaltic action. Duodenal cap normal. Stomach emptied in nine hours. Colon is seen dilated throughout and very little segmentation. Barium remained in colon for 72 hours.

Diagnosis Toxaemia due to gastro-intestinal stasis

Treatment I treated this woman at my office. She came daily after her work. I gave her sinusoidal 5 minutes over each side of abdomen. Auto condensation 10 minutes. It was about 2 weeks before any improvement began to show. She first noticed that she did not tire as easily and dizziness was gone. After the third week her headaches disappeared and she had her first normal bowel action. By the end of the first month her mental condition had cleared, she was eating well her strength returning and all signs of the toxæmia were gone. Treatments were now given three times a week for 2 weeks then twice a week for 7 weeks at which time she was discharged. It is now 4 years since she was discharged. I see her at frequent intervals and to date she has remained entirely well. Says she has taken but one cathartic since and that was during an attack of grip.

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Case No 4—A man, aged 54 farmer came January, 1922, complaining of vomiting weakness and loss of weight. Past history He has had stomach trouble for 20 years. Formerly had attacks of pain that came on 2 to 4 hours after eating Occasionally vomited. There was never any blood in the vomitus. The pain in the last 2 years has largely passed away but his vomiting is frequent. Food particles eaten the day before are often seen in the vomitus

X ray revealed a large dilated atonic stomach with no signs of peristalsis and an old healed duodenal ulcer with partial obstruction at the duodenum. Barium remained in his stomach 18 hours. He was given diathermy over the duodenal region and sinusoidal over the stomach and a Len hartz diet.

After a month's treatment his vomiting was gone and his strength improved. X ray at this time showed more peristalsis and a larger stream of barium going through the duodenal obstruction At the end of the 8th week he had gained 10 pounds in weight and had a good appetite, his strength was such that he was beginning to do the lighter chores about the farm.

After 10 weeks he was fluoroscoped and the stomach had taken on active peristalsis, the barium was seen to go through duodenum freely Treatment was continued for a total of 4 months and the patient discharged

It is now 3½ years since he was discharged and he has remained entirely well The past 2 years he has done all his own farm work.

The results here obtained can be attributed to diathermy softening and revascularizing the indurated duodenum thus creating a larger lumen, while the sinusoidal treatments retoned the gastric musculature.

Diathermy In the Treatment of Non-suppurative Middle Ear Pathology

By Ellis G Linn M.D

The very large number of you present who were up in the demonstration hall an hour ago will the more readily understand the measures used and the means employed in the care of faulty hearing and head noises about which I shall again talk to you for a few minutes. You will consider this talk, if you please a preliminary report only on the work that I am doing. We should be extremely careful not to give out a report as in any sense final without having had elapse a sufficient time to determine definitely exactly the permanent results that may be expected from the measures which we employ.

In this instance I have followed the exact measures now employed, not long enough to satisfy myself that there may not still be some helpful modifications along the line of work that I am doing.

A year or two years hence I should not employ the term 'preliminary' report. At this time I do and with that understanding I will say to you a few things which you may well consider in caring for those afflicted with faulty hearing or with that other ailment that distresses people so very much head noises.

The most valued of the senses with which we have been endowed is the sense of hearing. Sight is a very essential convenience and helps us much. It is a marvelous result of a faultless mechanism it represents the climax of creative thought and its value to the race is beyond compare. Vision and the organ concerned in recording it are just within the borderline of the impossible beyond which the Creator has not found it expedient to pass even in behalf of his announced "Image." But hearing is the sense that is of greatest value and that which is missed most when once we have been deprived of it. People who are altogether sightless will go about most cheerfully. They are always smiling and frequently laughing but the man whose hear-

ing has been taken from him by disease seldom smiles his face is always in a passive attitude, and in time it comes to be expressionless, meaning that he has lost communication with his own people and those round about.

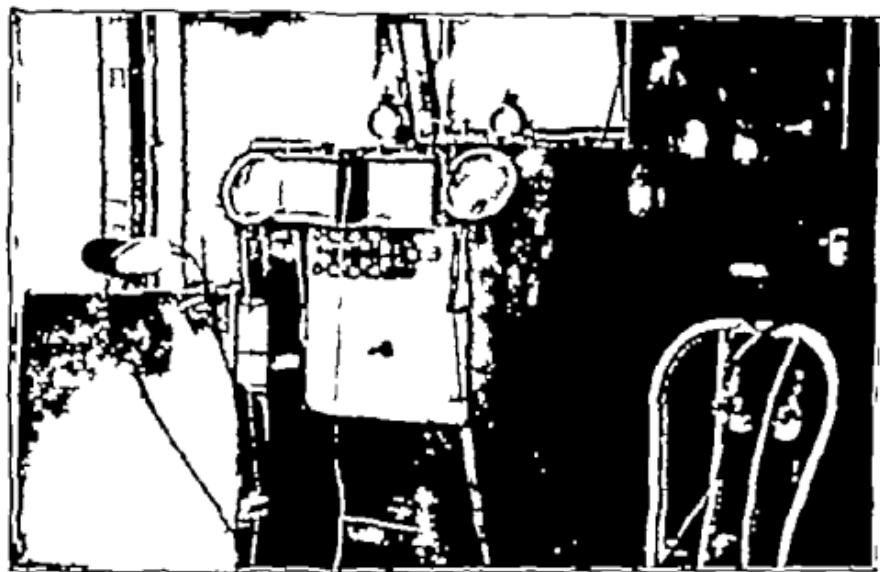
You have seen people who are suffering from head noises. Head noises may be from the mildest type up to a form which is seemingly unendurable. A co-worker of mine in Des Moines, an eye and ear man told me the other day that a little time ago a man came into his office who had recently consulted another specialist after careful examination (the man had catarrhal middle ear trouble with a very severe tinnitus) he said, "There is nothing I can do for you you have been told before that your hearing can not be improved and my experience tells me I can do nothing for you I am sorry but that is the situation"

Two days later the Doctor picked up the morning paper and read that the man had committed suicide, for no other reason than that the head noises had driven him to distraction and he believed the life before him was not worth while

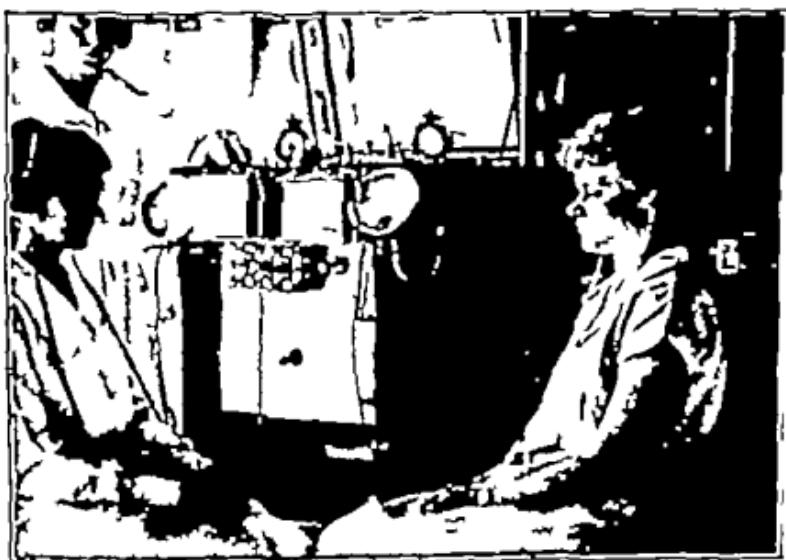
You are all familiar with the structure of the ear the outer the middle and the inner and I would like to call your attention to some of the points that will enable you to differentiate between some of the diseases of these structures that can be and those that can not be helped by Diathermy There are diseases for the treatment of which there is no justification whatever to treat these unrelievable cases is no more justifiable than to steal a man's money in the day time because you cannot favorably influence his condition

Some of the points then that enable one to differentiate between a few of those conditions which can be improved and those which can not, I hope to make fairly clear to you in this very short talk

The drum head all of you have observed should stand at a slight angle downward and forward at the inner end of the meatus and have a fixed definite appearance, about the color normally of the blue sky running across it in a direction with which you are thoroughly familiar is the hammer handle, and from the end of the hammer handle there is a pyramid like light reflex which enables you to determine that in any instance the drum is fairly normal



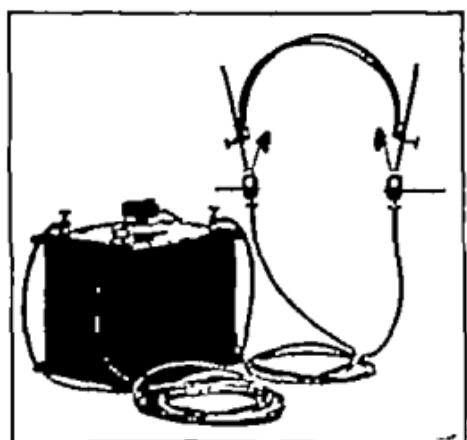
Special attachments for use in Diathermy to the ear



Above attachments in use



*Special "Headsets" for Diathermic treatment of
ear troubles*



Close-up of Dr Linn's apparatus



The apparatus in use

or otherwise. The drum head has from without, a certain amount of concavity. You will always observe that characteristic if it is normal if it is drawn more noticeably inward the condition points strongly toward impairment of the tube and middle ear.

The middle ear is a cavity which is somewhere nearly a half inch in its general dimensions, with a width of two millimeters at the base and probably four at the apex.

The eustachian tube enters this cavity through the anterior wall, slightly above the floor. Across this cavity is arranged the chain of ossicles terminating with the insertion of the foot plate of the stirrup into the membrane closing the oval window.

The movements of the drum membrane are very limited. The maximum oscillation of the hammer handle is less than a millimeter and that of the stirrup less than half a millimeter.

You can see then it would be fairly easy for inflammatory exudate to securely anchor the foot plate of the stirrup in a fixed position.

The muscles of the middle ear are very delicate. This is to be taken into account in determining the intensity and duration of the sinusoidal part of the treatment.

The eustachian tube is of smaller caliber about thirty six millimeters long with an open mouth a smaller or restricted part near the middle and then somewhat larger again at the point where it opens into the middle ear. The structures round about the mouth of the tubes are such that they very readily become inflamed and very frequently they are. The post pharyngeal and post nasal walls are the seat of frequent attacks of diseases attacks of rhinitis acute or chronic, are with us always. The tonsils are very frequently infected and the adenoids are always a menace to the hearing because the secretions therefrom readily find their way or are forced through the tube into the middle ear. In fact, practically all the suppurative processes which we find within the middle ear have had their entrance

through the eustachian tube because its opening lies proximal to frequently infected tissues.

Lying along the tubal walls are lymphoid deposits which become inflamed, are inclined to become oedematous and to form contact with the opposite wall of the tube. Pressure contact of these inflamed walls produces sometimes synechia, sometimes transient obstruction only. This frequent inflammation and oedema brings about a round cell infiltration followed ultimately of course by the usual pathology shrinking or contraction of the tissues and an atrophy more or less complete of the membrane lining the tubes.

The end result of this repeated tubal oedema and tubal occlusion, tubal wall contraction and tubal wall atrophy is a more or less wide open tube, which is in its way as pathological as a partial closure or partial stricture of the tube. The tubal pathology just outlined is paralleled by a like pathology in the walls of the tympanic cavity, except that repeated oedema congestion and exudation here results in more or less precipitation with numerous band formations which may restrict the movements of the ossicles or render them thoroughly immobile.

In the presence of exactly this pathology, particularly in its early stages and except in the more extreme forms, there is the highest possible justification for properly applied Diathermy combined practically always with other measures. So that colds, rhinitis or pathology of the tonsils, which may become chronic, or spurs which impinge upon the turbinates or polyps, which are not infrequently found or a sinusitis with which all of you have to deal any of these irritate and result in infective secretions, some of which may find their way through the tube into the middle ear. Many of these conditions are more frequently found in youth.

Fixation of the ossicles, occlusion of the oval window, limitation of oscillations impaired hearing, head noises to prevent all these, much can be done by giving proper care at the proper time. In fact, it is your business, it is my business when a child has had a cold to see that no pathol-

ogy of the ear remains unattended to provided there is evidence of involvement of the ears following the relief from the cold.

Evidence of involvement of the middle ear is most likely to be observable through an inflammation of the membrane itself a myringitis. Catarrhal conditions or congestion of the middle ear will result in oedema of the membrane with round cell infiltration and exudation all this with inflammation of the very delicate articulations between the several ossicles not infrequently produces adhesive bands which anchor the ossicles to some part of the tympanic wall.

Then too there are conditions with serious ear manifestations that can be influenced very little. There are conditions that can be influenced by local treatments apparently not at all. These conditions should of course, have general medical attention chlorosis mumps typhoid syphilis Meniere's Disease and paralysis of one or the other branches of the auditory nerve, and drug cases and leukemia all these may present serious ear manifestations and still may call only for general medical care.

In their stages of acute activity they do not call for the use of Diathermy and in this discussion I am ruling them out altogether. I shall in this discussion differentiate only between tympanic catarrhal pathology which is influenced in a most favorable way by properly applied Diathermy and Oto-sclerosis which in its true form, is probably not favorably affected by Diathermy or any other therapeutic measure.

Let me then point out to you some of the features that will enable you to distinguish between tympanic catarrhal involvement and Oto-sclerosis in well established cases of which Diathermy has no place except that it may be used in an effort in its early stages to retard the advance.

Although the two conditions may be found together and very generally are in greater or less degree still there is no direct connection between middle ear involvement and Oto-sclerosis which is a change in the bony structure round about the labyrinth a spongification absorption of original

bone structure and deposit of new pathological osseous tissue in place of the original normal bone.

There may be then as an evidence of chronic middle ear involvement, pain at times, which is never evidenced in Oto-sclerosis at all.

The drum head shows the markings of a middle ear involvement. In Oto-sclerosis it does not show such markings. Oto-sclerosis is frequently hereditary. It is found running through families not so middle catarrh. Oto-sclerosis is essentially bilateral, not to the same degree in each ear but almost uniformly bilateral middle ear catarrh is not essentially so at all not infrequently one ear alone will be involved.

In middle ear trouble the hearing is very rarely totally lost in Oto-sclerosis it is very frequently totally lost and in labyrinthine involvement the impairment is very likely to be total.

Treatments will be helpful in non suppurative middle catarrhal conditions. They will not be helpful in Oto-sclerosis nor will they in labyrinthine involvement. Oto-sclerosis comes on gradually. Catarrhal involvements are prone to appear suddenly and then recede more or less. Vertigo is very rarely observed in middle ear troubles. It is present in twenty two per cent of the cases of Oto-sclerosis.

Middle ear troubles appear with equal frequency in the two sexes. Cases of Oto-sclerosis which you can not help with Diathermy are found, fifty-eight per cent in women and forty-one per cent in men. There is an absolute fixation of the stirrup in practically all cases of Oto-sclerosis, and in only a small percentage of the cases of middle ear catarrh. Childbirth never particularly influences middle ear catarrh, it is very likely to unfavorably influence conditions in Oto-sclerosis.

Selbenmann believes that Oto-sclerosis is a developmental abnormality of the bony capsule of the labyrinth. Gray believes it is due to a failure of the local blood supply a condition of lowered vitality anemia and conditions akin

thereto Anemia is not likely to be present in tympanic troubles it is one of the causes probably of Oto-sclerosis.

Nasal obstructions may be a cause of middle ear troubles They have no influence in cases of Oto-sclerosis

Remember these three things and it may help you to differentiate between the two conditions In Oto-sclerosis the lower musical tones are not heard, or if heard they are heard indistinctly In Oto-sclerosis on placing the tuning fork upon the bone back of the ear it will be heard louder than if held near the ear in front. Not only is the tuning fork heard louder resting on the bone back of the ear than when held at the side or in front, but the bone conduction sounds are heard for a longer time than they should be in a healthy ear Any one here whose hearing is normal holding this vibrating No C tuning fork upon the bone back of the ear will hear it for about thirty seconds With the tuning fork pressed against the mastoid any one with Oto-sclerosis might hear No C fork forty five or even sixty seconds whereas before the ear became diseased they could hear it only thirty but they will hear it for a shorter time held at the side We have then in Oto-sclerosis the lower air tones shortened or lost and the lower bone conduction tones prolonged beyond the normal The higher tones in Oto-sclerosis are likely to be fairly well preserved

Politzer believes that iodid of potassium is helpful in middle ear troubles and early in Oto-sclerosis certainly Seibenmann believes that phosphorus is helpful but in my judgment the most helpful single influence that has yet been brought to bear upon non suppurative middle ear pathology is properly applied Diathermy

A large number of you saw in the demonstration hall upstairs an hour ago the exact technic regularly employed in our office in the treatment of non suppurative tympanic pathology

The Linn Bi Aural Bi Polar Electrodes together with the block tin pads were demonstrated on patients, and the full technic given in detail.

I believe you would not care to have all that repeated here. Diathermy in my office is always followed by the

surging sinusoidal current, administered through only the meatal electrodes, at point of comfortable tolerance and for two minutes only

Had I the time at my disposal it would be gratifying to read to you from the case records here of patients treated. In each of these cases the hearing has been very much benefited or the patients discharged as cured and in each case the head noises have been rendered less annoying or completely relieved.

Of all the considerable number of cases of non suppulsive middle ear pathology treated by the technic as now employed there has been no case in which improvement has not been noted in both the hearing and head noises.

We have too prescribed in certain instances the Sclerolytic X ray treatment as employed by Dr Richardson of Washington. Dr Richardson is a careful observer and a capable technician and may be followed with confidence. The Richardson Sclerolytic X ray dosage added to properly applied Diathermy offers encouragement to a large group of sufferers for whom little or no relief has before seemed available.

I have for a time been using the Quartz light in a group of cases, applying it through both the Quartz meatal applicator and about the auricle for its local effect on the ear structures as well as raying over the general surface for its tonic effect but I am not as yet convinced as to any permanently observable influence. There can however be no doubt of its tonic and reconstructive helpfulness.

I think I have talked as long as I should I thank you
(Applause)

Someone has asked me for the formulae that I said upstairs I would give you. The first formula is the one in which I dip the small pledget of cotton that will hold ten drops, and place with the forceps lightly against the drum head. This consists of benzoic acid two sodium chlorid one glycerin twenty strychnia thirty three, alcohol seventeen and water sixty one-hundredths.

Strychnia was used locally by Politzer who wrote so much of ear diseases many years ago

I use the following formula though rather infrequently in excessively patent tubes with sound as though of emptiness in the tympanum.

Dionin	2%
Strychnia	1/15%
Benzoic Acid	1%

Of this I blow five drops as a coarse spray through the eustachian catheter but never in the presence of mucous rales and never in the presence of a rhinitis a pharyngitis or other infective process round about.

I placed quite coarse rough bone scrapings in an alcoholic solution of benzoic acid After a few days no feeling of roughness or grit could be detected as the scrapings were rolled between the fingers This action as a calcium solvent, should exert a helpful influence in hyperplastic tympanic impairment

The localized action of Dionin is well known to all The tonic effect of strychnia should be helpful.

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Radiant Energy in the Treatment of Otitis Media

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(From *Eye Ear Nose & Throat Monthly*)

Treatment of Acute Purulent Otitis Media

When we summarize the customary treatment for acute otitis media, we are limited to rest, catharsis, the application of heat for the relief of pain and surgery. The popular way of applying heat has been either by a hot water bottle or by douching the external ear with a hot sterile solution. When these measures prove inadequate, the physician is forced to resort to an opiate or some coal tar analgesic.

The application of heat, undoubtedly, is of great service in the relief of pain, but unfortunately neither the hot water bottle nor the hot douche has proved adequate for all purposes.

Our experience has taught us that the greatest success can be attained with the radiant heat lamp, the so-called therapeutic lamp. The radiant energy given off by such a lamp is transformed into caloric energy, which is concentrated over the area and within the region of the ear without the production of burns even by long exposures.

The use of radiant heat light in otitis media is not altogether new as several reports have recently been published in the literature. Gerstenberger and Dodge recorded their experiences, which showed that radiant heat light is not only curative by virtue of the penetrating effect of the luminous spectrum into cell structure, but also a valuable prophylactic agent for the same reason.

There are various types of radiant heat lamps on the market. However the candlepower or wattage is not the same in all of them. We prefer to use a lamp with a 1,500-watt bulb, uncolored, and so arranged that the lamp may be raised or lowered and set at any desired distance from the area to be irradiated. In acute otitis media the heat rays should be applied at least once, and if possible two or even three times daily for from 40 minutes to 1 hour at each sitting. If applied more than once the duration of treatments may be less gauged according to the severity of the symptoms. The relief of pain is prompt the exudate is absorbed,

and in many instances there is complete resolution of the inflammatory changes in the drum membrane.

Even if the patient presents himself at a time when paracentesis of the drum membrane must be performed the light therapy is the after treatment *par excellence*.

Case Reports

The following cases are of interest because they show the indications for radiant heat and the possibilities with this form of therapy.

Case 1 J P, female age 25. Single, accountant. Had a "bad cold in nose" for three weeks when severe pain in the right ear developed and continued for two days. Pain was relieved when the ear began to discharge but recurred a few days later. There was severe pain and tenderness to pressure over the mastoid region. Examination revealed a bulging red membrane without normal landmarks. Hearing test, whispered voice at three feet. Paracentesis was performed under local anesthesia in the lower posterior quadrant. The ear was wiped dry and radiant heat light applied at the first sitting for 30 minutes at 30 inches. For home use warm boric alcohol was prescribed. No drains were used nor hot applications prescribed. For two days severe pain in the antrum region continued but the appearance of the drum indicated some recession of the infection. Radiant heat light was used daily for one week with the result that all pain disappeared, the discharge ceased and the appearance of the drum membrane returned to normal. According to the patient, similar symptoms and findings in the left ear three years previous were treated by operation on the mastoid.

Case 2 J B male age 15. Last summer a severe otitis media of the right ear developed after swimming. The drum membrane was bulging and presented every evidence of acute inflammatory changes. Pain was intense with slight serous discharge exuding from the canal. Five per cent warm phenol glycerine instilled into the ear and the hot water bottle did not relieve the condition. On the second day the radiant heat lamp was applied for 30-minute periods morning noon and night. After the first treatment the pain was appreciably lessened. The applications were continued for four days. The drum membrane did not rupture the bulging receded and the discharge cleared up. The inflamed drum membrane changed its appearance and after one week the entire picture returned to normal. There was some slight impairment of hearing which improved readily by catheter inflations.

Ultraviolet in Chronic Purulent Otitis Media

The employment of the ultraviolet ray in chronic "running" ears where no caries was present and where the pathologic conditions in the nose and pharynx had been corrected, has given favorable results. Preceding the lamp applications we instill into the ear canal an anilin dye such as mercurochrome or alcoholic eosin. A 2 per cent solution of mercurochrome is preferred. After instillation, it is allowed to remain for 10 minutes when the canal is mopped dry and the Kromayer lamp applied with suitable aural (quartz) applicator for 1 minute at the first treatment. The voltage of the lamp is accurately measured. The duration of treatment is gradually increased up to 3 minutes at the sixth application.

This therapy does not conflict with other measures which one may want to use. If inflations are indicated, these should precede the lamp irradiations. Home treatment when advisable consists of instillations of a 2 per cent mercurochrome solution once or twice daily. The local irradiations are usually followed by general body exposures for reasons which will be discussed later. The roentgen ray should be used as a diagnostic check to determine involvement of the mastoid.

Frequently, the results after persistent treatment are discouraging chiefly because some underlying focus has been overlooked or else the general condition of the patient is such as to offer the poorest kind of resistive elements. It is quite evident that accurate diagnosis is a very important factor in the success of the treatment for, without proper selection of cases ultraviolet therapy will occasionally fail to produce the desired results.

Case Reports

Two cases are here briefly reported to illustrate the types treated and the course they assumed.

Case 1 W. B., a girl 9 years of age, had had a "running ear" since she was 5 when scarlet fever had produced an otitis media. The drum at that time had ruptured spontaneously and the ear kept discharging intermittently, sometimes improving for a short period when some sort of treatment was instituted. Roentgen ray examination revealed absence of mastoid involvement and caries. There was a fairly large drum membrane perforation and only slight impairment of hearing. The cultures showed a mixed type of infection. The tonsils and adenoids had been removed at the age of 6 with little subsequent improvement. The patient was treated by the method described above. She was given local and general exposures, the latter for the favorable effect on body meta-

bolism. After eight treatments the discharge ceased and there has been no recurrence for nine months.

Case 2 R E M, male, age 17, was suffering from a chronic "running" ear for two years following an attack of influenza. Subsequently the tonsils and adenoids were removed. Examination of the nose revealed nothing abnormal. Various irrigating formulae were employed and frequently some slight granulations were cauterized with nitrate of silver solution, but in spite of every effort the discharge persisted. This patient was cured in ten treatments which were given at first every other day and later twice weekly. Inflations were employed preceding the light therapy.

(Reprinted from Fischer's Magazine)

Ultra-Violet Ray in Eye, Ear, Nose and Throat Troubles

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(Abstracted from *Eye Ear Nose & Throat Monthly*)

Actinic therapy has been available for many years for general body radiation, including skin diseases, by the use of the Alpine Sun Lamp—the large lamp. Not until the lamp devised by Kromayer, which bears his name, was it possible to make actinic applications to the closed cavities such as the ear nose and throat specialist requires. Only since 1913 has this lamp been available through its American manufacturers. This lamp generates great quantities of ultra violet rays in a quartz vacuum tube in which an electric current passes through a metallic mercury arc. A high temperature causes the mercury to vaporize and the ultra violet rays pass through the quartz tube from which it is directed to the field to be treated by suitable extensions also of quartz.

The attachments include a small quartz rod for treatment within the auditory canal, a small rod for the eye, a larger rod for intra nasal and sinus treatment a tube tipped with a quartz condensing lens for intensifying the radiation of the tonsils and pharynx a similar one only periscoped, to direct the rays at right angles and a large condenser for intensive radiation of external surfaces such as cervical glands, etc.

To convey the idea of the potency of this agency permit me to state that one minute exposure with this lens of a sensitive skin will produce an artificial "sun burn" with all the stages that one gets at the bathing beach—redness, then tan soreness and peeling in four or five days—and the lens itself remain cold all through the exposure, the patient experiencing absolutely no sensation.

Broadly indication for actinic therapy in our special field as elsewhere, is infections. It sterilizes corneal ulcers, traumatic injuries of the cornea or lids, all forms of conjunctivitis especially the diplococci infection, eczema of the external ear canal furunculosis and canal infection as in the bather's ear chronic middle ear suppuration hay fever (not curative but relieves the patient by destroying much of the accompanying infection) pharyngitis Vincent's angina (almost a specific) and tonsillitis, especially the acute.

Donnelly, of Detroit, has carried out a series of experi-

ments for the Detroit Health Department on sterilization of diphtheria carriers with success

The Kromayer lamp has assisted me in relieving or curing all the above conditions with the exception of the last—diphtheria carriers I have not had an opportunity to use it in such a case

The conditions in which I was most interested when I installed the apparatus were foci of oral and naso-pharyngeal infection other than the tonsils and adenoids. These cases which have a red nodular throat long after a clean tonsillectomy and adenoidectomy has been done. Often such cases carry a little temperature and the cardiac condition or the arthritis persists for some weeks or months after operation. I hoped by the use of the strong bactericidal action of the ultra violet ray to hasten the convalescence in these cases. I am pleased to report that thus I am now able to do.

It must be borne in mind that the lymph nodes in the tonsilar pillars, the infra tonsillar nodule, the lingual tonsil and scattered about throughout the surfaces of the respiratory tract carries infection. Also the epithelium itself provides a lodgment for it according to Rosenow. And as these areas are not amenable to surgical extirpation nor to medicinal measures the actinic rays may well be depended upon to fill in the gap.

While treating some non tonsillectomized throats in this manner I discovered a slight shrinkage of the tonsils in the free non submerged type. The shrinking was accompanied by a diminution in the congestion and the cryptic discharge. Were it possible to secure a deep penetration of this ray I am of the opinion that such tonsils could be destroyed by it. However as the penetration is limited to two millimeters sterilization can extend only that far. This is not however the entire action which we get from the agent. The local stimulation and increased metabolism which results no doubt raises the resistance of the infected field.

The limited extent to which the ultra violet ray will penetrate constitutes its limitation. This fact made me highly desirous of bringing about a shrinkage of tonsillar tissue so that these rays could extend deeper toward the capsule. This was especially necessary in the submerged variety of tonsils. My next interest lay in the x-ray shrinkage of tonsils and adenoids as proposed and carried out by Dr Witherbee late of the Rockefeller Institute for Medical Research.

At the present time I have a series of cases of all varieties of tonsils under alternate treatment with the two. In addition in those whose resistance is low I have thrown in an occa-

sional body radiation with the Alpine Sun Lamp. A few cases are discharged but under observation, not having had any trouble whatever this winter. I feel assured from the progress already made that I shall be able to make a favorable report on a series of cases later.

I do not wish to be understood as proposing a substitute for tonsillectomy, I am doing and expect to continue to do tonsillectomies, but in non-operative cases, and those who need but refuse surgery, this may offer an alternative. One case I have now under treatment has a chronic mitral regurgitation and another is a hemophiliac, a sister having bled to death from a tonsillectomy. Another is a woman near seventy five an asthmatic but who has a chronic tonsillitis with a severe arthritis, at times unable to walk. With such cases one should at least investigate thoroughly, without bias or prejudice an alternative to surgery.

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Hypocalcemia In Hay Fever and Asthma—A Definite Indication for Quartz Lamp Therapy

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Consideration of the blood calcium content and other etiologic factors of perennial and seasonal hay fever and asthma leads to three important deductions (1) Hypocalcemia is most pronounced in the perennial type of hay fever (hyperesthetic or vasomotor rhinitis) (2) The amount of calcium deficit is in no way indicative of the severity of the symptoms the blood calcium standard is an individual phenomenon rather than an arbitrarily accepted figure

(3) Contributory etiologic factors must be duly considered, viz., focal infection anatomic and physiologic nasal defects, notably arrested ethmoid development, obscure septic foci et cetera.

Two basic principles in addition are recognized

(1) The hypocalcemia or systemic element is the intrinsic causative factor

(2) Sensitization to proteins and pollens the so-called excitant, is the extrinsic cause. In speaking of a blood calcium deficit in hay fever and asthma, one should always remember that the associated toxic state is of much significance.

Of late little or no attention has been given to the predisposing causes of hay fever. The reason for this will be discussed later. Atmospheric conditions, temperature and climate, occupations, habits and every-day living influence the prevalence and production of the hyperesthetic diseases of the upper respiratory tract. These factors also alter the state of the human organism, and by so doing produce the systemic dyscrasia with its metabolic irregularities.

A G Gould, of Cornell University, in March 1924 reported some interesting observations regarding physical factors pertaining to hay fever. He compared the amount of hay fever relief obtained for two years with the precipitation records for corresponding years, and found that during the year when rainfall was plentiful and precipitation in excess the results with prophylactic treatment were good. Gould raises the question whether these physical factors were not more responsible for the relief obtained during that year than the prophylactic measures. "It is my personal opinion says he "that there are a great number of factors which have to do with the severity of hay fever. Some of these undoubtedly are the amount and frequency of rainfall the amount of growth of the plants responsible for the hay fever which is influenced by the amount and frequency of the rainfall the temperature, and the amount of sunlight the velocity of the wind the amount of exposure to the pollen the state of the anatomy of the nose and the personal hygiene of the patient."

The prevalence of hay fever was investigated by Scheppegele who concluded from his studies that the number of hay fever subjects is about 1 per cent of the entire population. In certain sections, where hay fever was thought to be uncommon it was shown to be on the increase. In California and Colorado hay fever is a common disease. New Mexico also had had much of the disease, as have the states of Washington, Montana, Oregon, Idaho, Arizona, Wyoming, Utah and Nevada.

This report indicated that hay fever is widely distributed probably sparing no populated community although in some sections the spring type prevails instead of the late summer or fall while in others the perennial is of very frequent occurrence.

Certain occupations unquestionably predispose to hay fever particularly the asthmatic form. Personal hygiene, or better still every day living obviously affects personal susceptibility. While much could be elaborated on these phases they are well recognized and have been discussed many times by various authors.

Whether or not one is an advocate of sensitization he

cannot be very favorably impressed by the conflicting reports forthcoming from reliable sources. Sanford, a few years ago published the results of his work on protein sensitization in the Mayo Clinic. Tests were made on more than 800 patients during a period of two years. Of this number more than 500 gave negative skin reactions. In 365 tests to *staphylococcus pyogenes aureus* and *staphylococcus albus* there was not a single reaction.

From an experimental standpoint these findings were important and of much interest. On the other hand from a practical and clinical standpoint, the actual value derived from the tests in the large majority of cases was nil. The multiplicity of evidence regarding the failures of diagnostic tests is quite astounding to anyone who has carefully perused the literature. Occasionally some successful results were reported. Precisely what causes the lack of uniformity in results so far as diagnostic tests are concerned and also methods of desensitization has not as yet definitely been established. Accuracy of dosage and methods of application—together with stability and quality of working material—undoubtedly influence the results obtained. When all is said and done, specific desensitization is uncommon and the physician in despair—eager to ameliorate the suffering of the patient—readily resorts to foreign protein therapy.

From a statistical standpoint, the actual cures from specific prophylactic or curative desensitization represent about 25%. However the same authors who give this figure claim that another 50% are made sufficiently comfortable to attend to their daily duties. These patients must have their injections repeated annually.

The use of bacterial vaccines autogenous and stock were also given thorough trials. The results were variable. Frank and Strouse gave combined pollen extract and bacterial vaccines during the attacks. The effects were disappointing.

Concentrated attention to diagnostic tests and desensitization has diverted some of the older views regarding the plausibility of a constitutional peculiarity. This phase was always known to predispose to hay fever although in the main it was an unknown quantity. For practical purposes

one must recognize irrespective of other phenomena, that there is always present a hypersensitive condition of the nasal mucous membrane.

The nasal membrane of hay fever subjects is of much interest from a physiologic standpoint. This undoubtedly has to do with its permeability and suggests at once the phenomenon of osmosis. Normally a nasal membrane should not be hypersensitive. When it is function is disturbed due in all probability to metabolic changes in the whole organism. The function may, however be restored by constitutional alterations aided and hastened by local agencies. The best proof from a clinical standpoint regarding the increased permeability of a hypersensitive membrane is the rapidity with which it absorbs medication as compared with a normal nasal mucosa. This will be illustrated in detail later.

It would seem that the tonicity of the nasal secretions also presents some influencing factors. Chemically the secretions vary little in hay fever subjects. The fact that these secretions are watery rich in chlorides suggested the possibility of poor or defective chloride retention or again, an excess in chlorides with nature's effort to cast off the surplus by increased excretory function.

This is probably due to a metabolic error controlled, in part at least, by the endocrines. On the whole, the problem is still open for solution. It is reasonable to assume, however that the control of nasal secretion so far as hay fever is concerned is based on disturbances of the endocrine glands. This is evidenced clinically by the favorable effects obtained in regulating the function of the nasal membrane by glandular therapy.

Anatomic defects are well recognized contributory causes. Few physicians, and particularly rhinologists are unable to tell of absolute cures in hay fever and asthma subjects by nasal operations unaided by other therapy. The report of Dr Maxwell H. Kalden a short time ago emphasized the importance with which one must regard nasal obstruction as a factor in hay fever. Adherents of the pollen treatment of hay fever in attempting to account for indifferent results point out that the upper air passages

of sensitive persons merit the attention of the specialist. If mechanical obstruction or deformity exist, surgical measures should be employed to correct them.

And yet we analyze a report by Lintz, who concluded from a study of 300 cases of asthma and other forms of allergy that 80 4% of the patients had been operated upon, yet not a single one was cured by any of these operations. Nose and throat operations were most frequently employed. Lintz was firm in his belief that the benefit derived from these procedures is negligible and they should be abandoned in the treatment of asthma and hay fever.

Thus a diversity of opinions has been expressed regarding the anatomic nasal defects. The consensus of opinion points to the merit of operative procedure when definitely indicated. One cannot be dogmatic in concluding from the results and observations of the minority that correction of nasal defects is not of material benefit, nor can one neglect to realize that in a good majority of hay fever patients there are definite operative indications.

This brings us to a consideration of the systemic causes. The Haseltine method of treating asthma undoubtedly has an analogous value in hay fever. This method has for its purpose general detoxication plus the eradication of the septic focus, whether found in the ethmoid region of the nose or elsewhere. Obviously this treatment is constituted on a toxemic basis. Kern very recently endorsed anti toxemic therapy for asthma as advocated by Haseltine, in addition that blood calcium studies and the influence of organotherapy must not be ignored.

That this contention is sound is best supported by clinical proof. The rhinologist, however, must not be narrow in his analysis of an individual case. Conjoined study with the internist is of very great value. In this connection special attention is directed to the problem of colonic stasis, for no single irregularity in the human organism is more capable of producing a stubborn state of toxemia. There may however be other latent causes—and these should be properly investigated.

Focal infection with special reference to teeth, tonsils and adenoids, sinus disease, etc., is worthy of special attention. No survey of this immense problem would be com-

plete without speaking of the possible factors involved in septic processes in the head should one or more be present in a hay fever or asthmatic subject.

Superficial examinations or reports, not supported by proper X ray and laboratory procedures, are valueless. Determination of septic foci in the teeth and gums by the dental surgeon must be more than opinion. The possibility of latent and obscure foci is too great to be passed by with only a cursory examination. The same is true with the examination by the rhinologist. Every known method must be put into play and when the final reports are considered each result should be properly weighed as an influencing factor.

When clinical and laboratory tests have been performed there remains one important avenue of investigation. This has to do with the chemical constituents of the blood more particularly calcium. The probable relationship of certain chemical constituents of the blood to hay fever and asthma suggested something which heretofore was little considered. It opened a new field of research which already has attracted the interest of many workers.

We are now recording the results obtained in a study of the blood obtained from a series of hay fever and asthma subjects, with reference to the following constituents: Calcium phosphates chlorides creatinin magnesium. As the number of specimens is not large, no data will be offered at this time, except with reference to calcium. The same statements made heretofore and now supported by further study and observation in additional cases may be repeated here. In perennial hay fever the blood calcium content is invariably low. In seasonal hay fever and asthma, the blood calcium is low in more than 50% of the cases, and in a certain number of those in whom the blood calcium content is not much below the accepted standard of 10.5 mgs. per 100 c. c. of blood serum the calcium therapy is equally as productive of favorable results as in those subjects who gave markedly low blood calciums.

As a result of this work, one must conclude, that the assumption of an arbitrary figure as a calcium standard is a decided error—if not in other calcium deficiency diseases

certainly in hay fever and asthma. The blood calcium standard is an individual phenomenon, dependent upon the individual's body resources. It is irrational to conclude that state of health diet regime, personal hygiene and environment have not an influencing course on the required content of blood calcium necessary to conduct a body free from disease, or at least, certain diseases. While 10.5 mg per cent may be considered normal it does not follow that this figure is always standard and this belief is further confirmed by investigations in hay fever and asthma. The question then arises—what is normal for the individual case? This is best answered when calcium therapy fails.

The effects of calcium therapy in asthma and also in hay fever long ago suggested a deficiency of calcium in the system, but just how this deficit manifested itself was never definitely demonstrated. Many investigators in search for an explanation chose the nervous system as a basis while others, again, believed that the nervous phenomenon played no part. As a result of recent studies success with calcium therapy in hay fever and asthma was attributed to a lowered calcium content of the blood and this at once led to the belief that a disturbed calcium metabolism existed. This view was strengthened further when it was found that a state of toxic absorption also was present.

The problem which presented itself was the regulation of blood calcium, for only in this way could a disturbed calcium metabolism be properly balanced. From the endocrine standpoint, the parathyroids are the calcium regulators. It would appear then that parathyroid substance meets the situation at hand. The indication for thyroid or parathyroid substance in the "deficiency diseases" especially with our knowledge and evidence of blood calcium deficit and its underlying toxemic state resolves itself into the problem of equilibrium between the sympathetic and the parasympathetic systems represented by the thyroid and parathyroid glands respectively. Any disturbance of this balance results in disease dependent on which of the systems has been affected.

This view is identical with the one voiced by H. W. C. Vines of Cambridge in a report which was published only last year. Vines concluded "The rationale of parathyroid

therapy is therefore simple, it is a means of re-establishing the normal endocrine balance of the body, which infection has disturbed, adequate resistance to disease is not a function either of the sympathetic system or of the parasympathetic system, but of the equilibrium between them'

It is generally held that the parathyroids have two functions, they regulate calcium metabolism and they are in some way able to prevent intoxication by guanidine and its derivatives. The influence of the parathyroids on calcium metabolism was best illustrated by the studies of Grove and Vines. They showed that calcium therapy in itself is insufficient to permanently influence the calcium in the blood serum, nor is it adequate to cause complete healing of the pathological condition existing. While some favorable changes were noted when calcium was administered by the injection route it was necessary to give in addition small doses of parathyroid substance by mouth. After this supplementary medication was instituted, complete healing resulted.

It may thus be understood that if a disturbed calcium metabolism is to be properly regulated, endocrine therapy must be called into play. It is on this basis that parathyroid substance is administered in hay fever and in asthma. However owing to the inertness or inactivity of parathyroid substance as it is now marketed thyroid extract is combined with it. The best results are obtained when thyroid, parathyroid and some salt of calcium are administered in suitable combination and dosage.

In approaching the subject of treatment, prevention is the important phase. Perennial hay fever and asthma do not lend themselves well to preventive measures, although it is reasonable to assume that this form of treatment is ideally conducted during the interval when symptoms are least pronounced. Seasonal hay fever however must be handled on a prevention basis if the treatment is to be accepted as rational. No single method or combination of methods can be prescribed as being specific. It must be said that seasonal hay fever prophylaxis is an individual problem in which two important elements must be investigated. First, the constitutional dyscrasia second focal infection with special reference to the nose.

The constitutional dyscrasia involves a study of the blood calcium and detoxication. Focal infection includes in its scope the correction or removal of every form of nasal dental, pharyngeal gastro-intestinal or pelvic pathology.

Mention has been made regarding the blood calcium deficit in hay fever and asthma. Other causes are purely contributory factors. In considering the blood calcium standard one must remember our contention that this is an individual phenomenon.

In seasonal hay fever the constitutional measures should be supplemented by desensitization of the nasal membranes. Although there are various ways by which this may be accomplished two methods were found to be very satisfactory. One, the slower procedure, is argyrol tamponage. Cotton tampons saturated with 10% argyrol solution are packed high in the nasal chambers and permitted to remain in place for a period of thirty to forty five minutes. This is repeated daily or every other day until the membrane is thoroughly desensitized. Just what other effects these argyrol tampons have we are not going to discuss at this time but certain it is that the action is both antiphlogistic and desensitizing. While this method is highly satisfactory it is slow in its permanent effect and therefore we have replaced it, in most instances, by medical diathermy and its complement modality ultra violet.

The technic for the use of diathermy in the nose is not new. It is described by many authorities in their texts. The only modification which we suggest is that the applicator be kept in motion during active treatment, thereby constantly massaging the mucosa in every accessible part of the nose. We employ as strong a milliamperage as the patient can tolerate for at least thirty minutes. Following this treatment the patient is permitted to rest for a short interval, and then the ultra violet is given by means of a nasal quartz applicator. This of course entails the use of the water cooled lamp. The lamp irradiations in the nose should not be more than two minutes at first and seldom if ever over four. Mucous membranes are not so tolerant as skin surfaces and the dangers of severe reactions and burns must always be remembered.

The perennial type of hay fever does not require local measures. In fact many cases are aggravated by nasal treatment. The time and duration of preventive treatment must at present be left to the discretion of the attending physician. Our experience during the past year convinced us that four weeks prior to the usual onset of symptoms is not too soon to commence active treatments and these should be at very frequent intervals.

How are we to influence the disturbed calcium metabolism? We have already spoken of the value of calcium therapy combined with thyroid and parathyroid. We have stressed the importance of vigorous detoxication. We have not, however, discussed the extreme importance of fixing permanently the calcium content after it is raised. This may be accomplished by several different methods. Endocrine therapy as already described, undoubtedly has a favorable effect in this connection. In other calcium deficiency diseases such as rickets, prolonged administration of cod liver oil was found to maintain permanently a calcium increase. Intravenous calcium therapy raises the calcium content of the blood to normal but just how long this figure is maintained is questionable. The fixing agent par excellence is the mercury vapor quartz lamp.

What is the action of ultra violet rays from an air cooled lamp? This question we can only attempt to answer theoretically. However certain fundamental principles are well recognized. When the entire body is rayed there is a general stimulating effect upon it. That this effect is produced by a certain action upon the blood modifying the chemistry of it, seems to be the most plausible explanation. Blood serum shows an increased calcium content under ultra violet irradiation in rachitis and in tetany in which diseases a deficit of blood calcium and phosphorus is known to exist.

It is of interest also to speak of the immediate effects of the rays on the skin. That there is an increased physiologic action of the skin is not to be doubted. After the first application a dermatitis or erythema appears, the severity depending upon the amount of deposited skin pigment. This skin reaction does not occur with succeeding exposures. The protective action of skin pigment explains why negroes have to be exposed decidedly longer than

whites and why fair skinned and blond individuals receive a marked skin irritation from the first application. The ultra violet rays are absorbed by the epidermis.

In hay fever and asthma, the effects of the irradiations from the quartz lamp are explained on the basis of a blood calcium deficit and probably some other actions with which we are unfamiliar at the present time. Some writers attribute the relief which patients obtain in part, at least, to the ozone which the lamp generates. There may be something in this. It is a point which is worthy of some thought. Others again are inclined to the view that it is the biologic influence which is of greater value.

That such an influence is paramount in the successful treatment of the hyperesthetic diseases according to the principles suggested is quite evident. The quartz lamp serves as a fixing agent. There is no other form of therapy which answers this purpose so well. Irradiation by means of the air cooled lamp aside from other effects which may be produced definitely and conclusively raises the blood calcium content and maintains it at normal or very close to this standard. The influence on the blood phosphorus will not be considered because our investigations have fairly well convinced us that the phosphorous content of the blood is of little significance in hay fever and asthma.

The therapeutic technic in hay fever both of the perennial and seasonal types differs somewhat, and the same may be said also of asthma. In the perennial type of hay fever the time of the first treatment is one minute, of the twelfth treatment ten minutes. The average is six minutes. The total time which is consumed by twelve successive exposures is 75 minutes. The initial application is made with the distance between lamp and patient at forty inches. This is gradually diminished until at the twelfth treatment a twelve inch distance is reached.

In seasonal hay fever and in asthma much more intensive raying is necessary. At first a two to three minute exposure is made, with an average time during twelve treatments of $9\frac{3}{4}$ minutes, and a total of 117 minutes. The distance between lamp and patient at first is 28 inches and at the twelfth treatment 12 inches.

It must be emphasized that ultra violet therapy is not a panacea in the cure of hay fever and asthma. On the other hand, one can say unhesitatingly that the physician or specialist who does not utilize the quartz lamp and other physiotherapeutic modalities as adjuncts in the treatment of hay fever and asthma, is failing to avail himself of valuable modern aids to ameliorate the distressing symptoms of these maladies. Again one must remember that physiotherapy is not employed to the exclusion of other recognized methods. In our work in hay fever and asthma, two essential avenues are exploited to the utmost namely the local and the systemic. The local factors involve rigid medical and surgical intervention for the removal of every possible focus of infection in particular that of the nose. The systemic factors include proper consideration of metabolic irregularities nutritional disturbances and endocrine dysfunctions.

Each and every one of these phases must be studied at length and indications met as presented.

One more important point, not covered in the text which has much to do with the successful handling of hay fever and asthmatic patients, is hospitalization. Whenever at all possible this should be insisted upon to enhance favorable results, according to the old doctrine of *tuto cito et jecunde*.

Light in the Treatment of Infections

By E. C. Henry M. D
Omaha, Neb

It is not the object of this paper to give technique or mode of operation in Light treatment but rather to call attention to the types of infection in which Light is a powerful adjuvant.

It just happens we are living in the Drug Age. It was not always so. One of the most interesting chapters in the story of Medicine is the evolution of treatment. Long before pharmaceutical houses or commercial factories made tinctures and X rays our fathers knew the value of water, light and motion in treating disease.

But there came a period when commerce reigned supreme and the best doctor was the one who could put together the most drugs in a prescription. Without meaning to be in the least sarcastic we just offer a silent prayer of gratitude to Divine Providence for the marvelous human stomach able to survive, say Warburg's Compound. The writer wishes to make himself perfectly clear on this point for reasons to be shown later.

He is a regular practitioner of medicine and for a quarter of a century has followed the teaching of Medicine and Surgery. He cannot bind himself however to any clique or cult who believe Wisdom is their exclusive property and will die with them. Frankly he realizes that there is not one single drug used by the physician that he has any adequate conception of how it acts when taken into the system.

Let us take a concrete example to complete our illustration. An operation is to be performed ether is administered in one of three ways—by lung, bowel or vein. In a few minutes the patient is unconscious. What has taken place no man knows yet the discovery of anaesthetics is one of the Glories of Medicine and we use it because experience that Master Teacher showed us its value.

Comes now a great religious teacher who is interested in electricity and urges doctors to investigate and see if this strange force cannot be used to relieve human suffering but John Wesley was told to attend to his business of saving souls and let doctors cure the body. Until 1895 when the X ray

was discovered electricity was not respectable in Medicine Until Finsen in Sweden and Rollier in Switzerland presented to the world hundreds of cured cases Light as a treatment for disease was laughed at.

Light and Electricity are so intimately combined in treating infections that they must be discussed together When your brother doctor asks you how it works come back like a good Yankee and ask him how an antiseptic works and when he begins in a learned way to talk about hydrogen ions just say, "Words words words" He doesn't know neither do you know the exact modus operandi of Light—it just does it.

Certain types of infection are so strikingly benefited by this new method of treatment that it would be well to consider them in detail Take first boils and carbuncles Boils are painful but not especially dangerous

It is remarkable how a single treatment of X ray and light will dry up a boil Almost immediately the pain is gone and in two or three days it has come to a head a small opening is made and no scar is left

A carbuncle is a different story Often it is the final break of Diabetes Mellitus, and in its final analysis Diabetes is the story of bankruptcy Metastatic abscesses and a Surgical kidney are fairly common in Carbuncles so that any case must be watched with great care Being poor surgical risks we welcome any treatment that avoids the knife and anaesthetic.

X ray Radiant Light and Actinic (air cooled) or in selected cases Surgical Diathermy, are the best treatments Whether the knife or Surgical Diathermy is used, the large ulcerated area must be healed and the edges watched for fresh foci The Light furnishes great relief from pain

Radiant Light is used from twenty minutes to three quarters of an hour according to the case Many patients go sound asleep during treatment Surgical tuberculoses are ideal cases for light treatment When the tubercle bacilli combines with its symbiotic friends the strepto and staphylococci it forms a sinus hard to heal Light doses of X ray plus radiant light and fractional Actinic will cure the majority of cases many of which are only made worse by the knife

Let us remember there is no such thing as a local disease There is a local manifestation of a systemic disease Acute appendicitis is a systemic disease with a focus at the appendix tonsillitis is a systemic infection with the tonsil as the point

of entrance. In all systemic diseases two striking changes occur—1st changes in Metabolism 2nd, changes in Circulation. The patient dies when he cannot recover his equilibrium both as to metabolism and circulation. The doctor can do the most good by helping nature in her great task. Hence the fractional method of treatment in bone or joint tuberculosis. Its great object is to equalize the circulation by drawing the blood from the congested parts and sending it back vitalized with fresh proximate principles. If the proximate principles such as calcium phosphorus or potash are being thrown out of the system unused light properly used will act as a mordant and fix them in the red blood corpuscle in such form that they can be utilized by the body.

Last but not least come post-operative infection. True we have surgeons who will tell you how many cases they have operated without a sign of pus. You may not be so fortunate and would like to know how to cut in half the time in the hospital of these pus cases. Any time after a week following a pus appendix or an infection of the abdominal wall light can be used to great advantage. In a recent article by Rollier he calls attention to the need of physicians learning how to use light if they expect results.

Light is a powerful agent and can make a patient very sick if not rightly used. Light improperly used on the wrong kinds of cases is the cause of many failures so in closing may the essayist put in some negatives?

Do not buy an X ray and expect it to do everything

Do not buy a Fischer Cabinet and expect it to practice medicine for you—it won't

Do not buy a Burdick lamp and let it anesthetize you into believing it will do your diagnosing and treating

Finally one closing positive suggestion. Get your newest books and study day and night Heat Light and Electricity or the chariot of Medical progress will run over you.

Galvanism

By Charles E. Stewart, M. D
Battle Creek, Mich.

Electricity, when used as a therapeutic measure, may be used either in the form of galvanism, faradic, sinusoidal, high frequency or static, the form used in any given case depending upon the results desired. Electricity is used for the mechanical, thermal or chemical effects produced when applied to the human organism.

In this connection, let us briefly consider the subject of galvanism as a therapeutic measure.

The galvanic current may be derived from a number of different sources, either from wet or dry cells, or a lighting circuit. If the lighting circuit is supplied by a direct current the galvanic or continuous current as it is frequently called, can be obtained by direct connection, but if it is of the alternating type, it will be necessary to use some form of transformer or rectifier to change it over to the direct type.

The galvanic current was the first current discovered, and because of its simplicity is comparatively easy to understand and when once fully understood the student will find it much easier to understand the other forms.

The simplest way to produce the galvanic current is by means of a simple cell consisting of a receptacle partially filled with a dilute mineral acid, such as hydrochloric or sulphuric, into which are introduced two dissimilar elements such as zinc and carbon or zinc and copper. The parts of the elements above the fluid are designated poles and when these are connected by a copper wire chemical action takes place in the cell, resulting in the formation of an electrical current conducted along the wire, the presence of which can be readily demonstrated by placing an appliance known as a galvanometer in the circuit—this is the galvanic or continuous current.

When this current is applied to the body, complex molecules are broken up and other combinations effected, atoms become charged with electricity accompanied by a migration of ions in the pathway traversed by the current resulting in chemical changes. The fact that chemical changes can be produced within the tissues of the body by means of the galvanic current makes it a valuable therapeutic agent which can be utilized to advantage in the treatment of a number of pathological conditions.

In the use of the galvanic current as a therapeutic measure several fundamental principles must be well understood and kept in mind. In the first place the effect produced by the current is different at each pole. The positive pole produces contraction of the blood vessels, is soothing to sensory nerve endings, relieves pain and hardens newly formed tissue especially scars.

The negative pole produces opposite effects—dilates blood vessels, irritates sensory nerves and softens scar tissue.

The polarity of the current may be readily determined by filling a small receptacle with a weak salt solution when the apparatus is connected up place the tips of the cords half an inch apart in the solution and turn on the current and soon bubbles will be seen to collect at the negative pole.

When applying the current to the body, first moisten the electrodes with a normal saline solution which reduces the resistance of the skin to a considerable degree.

This form of current is useful for the following purposes:

- 1 Introduction of drugs into the tissues (medical ionization)
- 2 Destruction of tissue by the accumulation of caustic elements at the point of entrance or exit of the current (acid and alkalis)
- 3 Sedative effect on sensory nerves (relieves pain)
- 4 Stimulation of sensory nerves
- 5 May be used to soften scar tissue

In using electricity as a curative measure it must be clearly understood that the benefit derived is not because it is electricity but because it produces definite changes in the tissues either of a thermal mechanical or chemical nature.

The effect of the galvanic current is predominantly chemical and definite chemical changes are produced in the tissues when this form of current is applied acid accumulating at the positive pole and alkali at the negative.

GENERAL INSTRUCTIONS REGARDING TECHNIQUE

Before attempting to administer any form of electricity be sure that the apparatus is in perfect working order—all connections should be made tight—all attachments should be bright and clean and free from all oily substances. Test polarity frequently.

Electrodes should be well constructed the indifferent one being considerably longer than the active which is placed as near as possible to the area to be treated and the indifferent one as nearly opposite as possible.

The amount of current used depends largely upon the size of the smaller or active electrode—using not more than 15 milliamperes of current per square inch of electrode.

The shape of the active electrode depends upon the shape of the area to be treated—if a small localized area, a correspondingly sized electrode should be employed if a long, narrow area, then a long narrow electrode must be used.

The electrodes are of metal with a terminal soldered to the center—they are usually covered with felt or gauze and should be soaked in a 1 to 2% saline solution before being applied.

The skin area to which the electrodes are to be applied should be free from oily material which if present, can be readily removed by alcohol. The electrodes should then be firmly applied to the proper areas and may be held in place by bandages.

At the first treatment it is well to advise the patient regarding the nature of the treatment and what sensations he is likely to experience gaining his confidence and co-operation to the fullest extent.

In applying the current, it should be turned on slowly and gradually at the same time observing both the patient and the meter. If there is complaint of a stinging or burning sensation which becomes annoying to the patient, the current should be turned off slowly, when a careful examination is made to see if the electrodes are properly covered and moistened or that there is no abrasion of the skin. Where treatments are to be continued for more than 15 or 20 minutes the electrodes should be again moistened before continuing the treatment longer. At the termination of the treatment gradually turn off the current, dry and dust the patient's skin with talcum powder. Normally there is only a moderate hyperemia of the skin, and an agreeable feeling of warmth in the parts treated.

PRECAUTIONS

The patient should not be conscious of more than a slight tingling in the part to which electrodes are applied.

Do not depend upon meter readings alone—take into consideration the patient's reaction. If the meter reading gradually recedes it is quite likely that the electrodes are too dry.

If abrasions are present cover with adhesive before applying electrodes.

In applications to the head never use a large amount of current—turn on and off very gradually.

If there are signs of vertigo, discontinue treatment by turning off current very gradually

In using the movable electrode do not remove it from the skin as long as the treatment is being given and turn off current before electrode is removed when treatment is completed

Do not allow any metal to come in contact with the patient's skin

Exercise great care in the treatment of anesthetic areas—using less current over a shorter period of time if necessary

If apparatus is not working satisfactorily always turn off current before attempting to make adjustments

The galvanic current can also be used to advantage in hydroelectric baths, either general or local. In these baths a greater current strength can be used and more intimate contact can be made. In using galvanism in this manner the operator should satisfy himself that the apparatus is in good working order and should know the exact temperature of the water before the patient is allowed to enter the bath. The current should not be turned on until the patient has been placed comfortably in the bath when it should be turned on very gradually and the attendant should not leave the patient while the treatment is being administered.

MEDICAL IONIZATION (ELECTROLYSIS)

The galvanic current when made to pass through living tissue causes certain chemical changes to take place with the result that acids accumulate at the positive pole and alkalies at the negative. This is due to the fact that the galvanic current breaks up the various acids bases and salts which are in solution in the tissues into atoms which take on different electrical charges when they are termed ions and because of their instability readily form new chemical combinations. These ions are set in motion by the current when they readily select their electrical affinity with the result that acids are produced at the positive pole and alkalies at the negative.

Ions which are positively charged are called Cations and when introduced at the positive pole travel toward and accumulate at the negative pole. They are made up of hydrogen and many of the metals.

The ions which are negatively charged are called Anions and travel toward the positive pole and include chlorine common bases and the hydroxyl group.

The rate with which these ions travel is in inverse proportion to their atomic weight, the lighter travelling at the greatest speed, the rate diminishing in proportion to the increase in weight.

These principles of ionization are utilized in cases where it is desired to introduce certain drugs into the system. The number of drug ions which is driven into the tissue is proportionate to the density of the current, the duration of the treatment and inversely to the atomic weight of the ion used. It takes about one hour to ionize a tissue with a moderate current, and a solution of the drug of about 1 or 2 per cent.

In cases when medical ionization can be used, it has a distinct advantage over the common method of introduction through the gastro-intestinal tract in that it can be applied directly to the affected area instead of a general distribution throughout the body which occurs when taken by mouth. On the other hand there are disadvantages especially in that only a very few drugs can be successfully administered by this method, and the effects are chiefly on the skin and subcutaneous tissues.

In applying drugs in this manner, we apply under the negative pole chlorine in the form of sodium chloride, iodine in the form of sodium or potassium iodide, and salicyl from sodium salicylate.

Under the positive pole we use zinc from zinc sulphate, magnesium from magnesium sulphate, lithium from lithium chloride, silver from silver nitrate, copper from copper sulphate, and morphine, cocaine and quinine.

In order that we get a practical idea of how medical ionization is employed, we will give in detail the treatment of a case of sciatica by this method:

First, select an electrode which will be sufficiently long and of such a width that it will cover the area involved; in this instance it should be of sufficient length to extend from the sacro-iliac notch to the popliteal space and about $2\frac{1}{2}$ inches wide. This is the active electrode. The indifferent electrode should be of the same length but broader, 4 to 5 inches to be placed opposite the active electrode. These should be properly covered and soaked in warm saline solution then apply freely over the active electrode a warm 4 or 5% sodium salicylate solution. This when diluted by the fluid already in the electrode will make a 2 to 3% salicylate solution. Then apply over the course of the sciatic nerve a layer of absorbent cotton soaked in warm normal saline solution, the

excess of which has been squeezed out then pour on to the cotton the warm salicylate solution and apply the active electrode directly over the cotton and connect to the negative pole of the machine. Then place the indifferent electrode opposite, over the anterior surface of the thigh connecting it with the positive electrode. Bind both on snugly with bandage and apply current slowly, using 8 to 10 milliamperes for 40 to 50 minutes. Turn current off slowly removing electrodes dry off and dust the skin.

In giving a treatment of this length it is best to remoisten the electrodes once during the period.

The actual destruction of tissue may be accomplished by the use of the galvanic current and when used in this manner is known as

SURGICAL IONIZATION

To accomplish this instead of using the ordinary active electrode as in medical ionization a much smaller one is used which consists of pointed metal applied directly to the part as in the form of a needle.

Care should be used in the selection of the active electrodes for surgical ionization as steel for instance when used leaves a black stain. Platinum is probably the best of all for this purpose.

The apparatus and indifferent electrode to be used for this purpose are the same as for medical ionization. The active electrode or electrodes are inserted into the part to be treated. The current is then gradually turned on and when a slight blanching of the part occurs the needles withdrawn and if desired inserted into another portion of the mass.

Battle Creek Sanitarium

(Reprinted from *Fuchs's Magazine*)



Abstract of an Article

By G W Crile, M. D., F A. C. S.
Cleveland, Ohio

Entitled

The Use of Diathermy and of the Quartz Lamp for Conserving the Temperature of the Viscera and Promoting the Welfare of the Patient Before and After Abdominal Operations"

Whenever Dr. Crile puts pen to paper we expect to read something of an original character which sets us thinking.

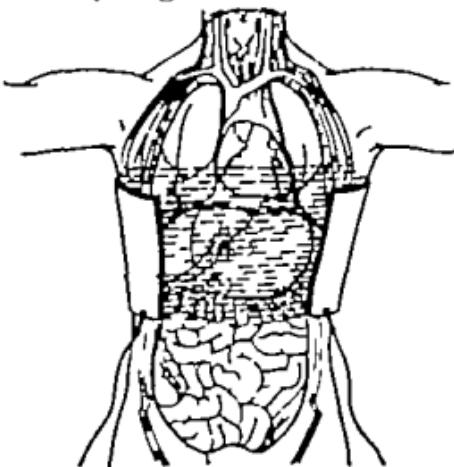
In the present instance after first drawing attention to the dangerous effects of cold and exposure during abdominal operations, he has asked himself Why do not the ordinary external applications of heat tend to act as preventative or corrective measures at such times? Why? Because as a result of the exposure of the abdominal viscera some vital organ has been seriously affected in its function and the external application of heat does not reach down and touch the spot.

Dr. Crile has probed deeply until he has been able to place his finger on the organ most vitally affected, and then finally, having followed his clews as to etiology, he has cast around and found a method of heating through the organ in question and keeping up its temperature, both during and after operative interference. But let us tell you his story in greater detail.

THE DANGERS OF COLD AND EXPOSURE TO THE ABDOMINAL VISCERA

Dr. Crile at the outset states that it has long been known that chilling of the intestines produces a deleterious and warming a beneficial effect. Exposure of the abdominal viscera may of itself produce a fatal result—an occurrence which has frequently been observed both in the clinic and the laboratory.

External applications of heat to the body by means of hot water bottles etc. have usually proved ineffective in preventing the dangerous lowering of temperature to which reference has



Above illustration showing effect of Diathermy current as used for heating through the entire field during an abdominal operation, according to Dr. Crile's method.

been made. According to Zondek "Our findings confirm those of Chelmonski, Wendarnier and Schutze, Elchel and Schemel, and others who conclude that cold applications to the body surface cause a lowering in temperature of the underlying organs and warm applications affect temperature to a less degree."

Stengel and Hopkins found that the application of ice bags over the gastric area produced an average drop of 0.9 to 1 degree Centigrade in 45 minutes, while the effect of hot water bottles in the same position for the same period proved almost negligible.

As Dr Crile points out these apparently anomalous observations indicate that the function of some vital organ or tissue has been depressed by the lowering of temperature caused by the application of cold, and this fact explains why, in some cases the application of extensive hot packs prove insufficient as a means of overcoming the result of exposure of the viscera during an abdominal operation.

THE ORGAN MOST VITALLY AFFECTED

Dr Crile has conducted an intensive investigation in an effort to determine which organ is vitally depressed in function as a result of cold and exposure and in addition to devise some means whereby the depressing effects of cold upon the viscera might be obviated.

In studies of the variations in temperature of various organs and tissues under many different conditions it was found that the temperature of the liver together with the temperature of the brain fell progressively when the viscera were exposed. In fact, it would appear that cold practically eliminates the essential function of the liver.

It was also found that the removal of no other organ except the brain produced so marked an effect upon the organism as the removal of the liver which results in a rapid and steadily progressive failure of function of all the organs of the body. Strange to say this effect is even more marked than that which follows the removal of the brain itself as if artificial respiration can be maintained the rest of the organism can survive for a longer time without the brain than without the liver.

The conclusion is therefore that the liver is an organ which performs a major function in the organism.

It also follows that the extent to which the liver of the patient is functionally impaired largely determines the surgical risk of

operative interference. In planning the management of surgical operations, therefore it becomes of prime importance to protect the function of the liver. While this applies to any surgical operation, it is naturally of more particular importance in the case of abdominal operations and of prime importance in association with operations upon the liver, gall bladder, and common duct.

A well known biophysical law states that a change of one degree in temperature affects the chemical activity of either a physical or biological system 10%. When, therefore, the temperature of the liver is reduced one degree, its chemical activity is reduced 10%. It will readily be seen, therefore, that if exhaustion incident to disease, as in cancer of the stomach, has reduced the chemical activity of the liver of the patient to 10% of its normal activity, then, if the temperature of the liver is reduced but one degree when the abdomen is open, death will inevitably follow.

LABORATORY OBSERVATIONS

In the course of Dr. Crile's experiments it was found that when the abdomen was open, even where the liver was not touched the temperature of the liver fell from $1\frac{1}{2}$ to 3 degrees, the brain likewise showing a similar fall of temperature. Under ether anaesthesia a similar lowering of temperature on the part of both organs was observed. Under nitrous oxide anaesthesia, however, neither the temperature of the brain nor of the liver was affected. A lowered blood pressure, induced by hemorrhage, also lowered the temperature of the brain and liver.

An interesting experiment conducted on animals further illustrated the vital character of the liver function. It was determined that whereas the brain normally responds to the injection of adrenalin by an immediate increase in temperature of from $\frac{1}{2}$ to 1 degree, no such change in temperature is observed following an adrenalin injection.

If the liver has previously been removed from the results of these experiments one can well understand why the mere exposure of the abdominal viscera may cause death in a very sick patient even though no operation has been performed and no general anaesthetic administered. We can also understand why the addition of the general anaesthetic and the operative procedure to the exposure of the intestines may bring about death, even where the patient is not desperately ill.

As a means of determining whether heat applied to the ab-

domen would counteract the tendency to lowering in temperature during operation, hot water was introduced to the stomach of test animals. It was observed that an immediate rise in temperature of the liver resulted and that this coincided with a rise in temperature of the brain.

Dr Crile's laboratory investigations therefore, suggest that the application of heat to the liver by conserving the function of that organ, should counteract the effect of exposure of the viscera in any abdominal operation.

UNSATISFACTORY METHODS OF APPLYING HEAT

In the past attempts have been made to meet this requirement by the application of hot water pads, hot tapes, the use of a hot water mattress, and a superheated operating room but none of these methods has proved satisfactory to any degree.

THE APPLICATION OF DIATHERMY

It was apparent to Dr Crile that the only satisfactory method of preserving the normal temperature of the liver during operation would be by the employment of some system which would heat through the tissues more particularly the liver without unduly affecting the outside surface. The principles of diathermy at once suggested themselves.

Diathermy which consists of the passing of a current of high frequency through the body of the patient has the property of heating the subcutaneous tissues without affecting the external parts in contact with the electrodes of the apparatus. Dr Crile felt that if one pole of the diathermy apparatus were placed upon the lower chest on one side and the other pole brought opposite the dome of the liver then the current would pass through the upper abdominal organs including the liver. Now if this current could be continuously applied throughout the operation the temperature of both liver and abdominal viscera in general would be maintained at or above the normal, regardless of the exposure of the intestines.

Dr Crile also points out that on account of the enormous spread of the capillaries veins and arteries very near the surface of the viscera the blood in the whole splanchnic area almost immediately assumes the temperature of the air to which it was exposed. By the passing of the diathermy current through the liver and the neighboring viscera this thin layer of blood would as it were be made to pass over a hot table so that warm blood would pass into the rest of the circulation.

THE RESULTS OF PRACTICAL DIATHERMY

In Bad Risk Cases

In accordance with this conception, Dr Crile and his associates have been applying the diathermy current in certain bad risk cases. They have found that the electrodes can be put in place and the diathermy current established before the abdominal incision is made and that neither the surgeon nor the patient need be aware that such a current is passing. By actual observation it has been found that the temperature of the dome of the liver can be maintained above normal throughout an extensive operation in which the abdominal viscera are widely exposed.

In Feeble and Aged Patients

In this type of case it has been observed that a higher incidence of pneumonia takes place following abdominal operations than after operations of an equal magnitude on other parts of the body.

APPLYING DIATHERMY THROUGH THE BASE OF THE LUNGS

As a possible explanation of this occurrence, Dr Crile advances the theory that cooling of the liver results in a general depressed function of the organism together with cooling of the blood in the important organs within the chest wall. He and his associates are therefore now noting the effects of diathermy in lessening the incidence of post-operative pneumonia.

In feeble and aged patients after especially wide and prolonged exposure of the upper abdomen, repeated doses of diathermy are delivered through the bases of the lungs. In addition to the advantage of heat to the part, the increased temperature must tend to bring about a more active circulation in this area and thus increase the natural defense against infection.

As an alternative method of maintaining the temperature of the body and in that way promoting circulation and general metabolism Dr Crile suggests applying the terminals of the high frequency apparatus to the feet. In his own practice it is so arranged that the terminals are placed in position before the patient leaves the operating room—the apparatus being wheeled beside or behind the surgical carriage to the patient's room where it remains as long as this treatment is indicated.

(Abstracted from *S. G. & O. Jour.*, Feb., 1926)

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